Adelaide Fire Station

Detailed Site Investigation 2022

South Australian Metropolitan Fire Service

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Executive Summary

GHD Pty Ltd has been engaged by the Metropolitan Fire Service (MFS) to complete a Detailed Site Investigation (DSI) at the MFS Adelaide Station (the site). The site is located at 99 Wakefield Street, Adelaide SA 5000.

Historically, the MFS has used aqueous film-forming foams (AFFF) containing per- and poly-fluoroalkyl substances (PFAS) at the site during training activities. Foams containing PFAS have not been used at the site since 2016.

In 2016 and 2017, GHD completed limited investigations of the PFAS impacts on-site soil and within the on-site drains and dam (sediment and surface water). PFAS contamination in soil, surface water, sediment and groundwater were identified but not delineated. It was also concluded that the concrete walls of the dam were likely contributing to PFAS impacts in the retained water.

In July 2021, GHD completed a groundwater investigation, including the sampling and analysis of six existing groundwater monitoring wells to determine the nature and extent of on-site groundwater PFAS impacts. The investigation identified the presence of PFAS contamination in groundwater, however, the extent of the impact was not delineated. It was considered that the PFAS-impacted groundwater would likely extend off-site with the potential to impact downgradient groundwater users and ecological receptors.

The site has been deemed by the South Australian Environment Protection Authority (SA EPA) as a Level 2 regulatory priority in accordance with the SA EPA Site Contamination Regulatory and Orphan Site Management Framework (2017). In a letter dated 23 November 2021, the SA EPA requested that a DSI and risk assessment be completed and provided to the EPA.

The objectives of this investigation are:

– To determine the nature and extent of PFAS site contamination, both on- and off-site.
– To assess the potential risks to human health and the environment associated with on-site PFAS contamination, in the context of continued industrial use.
– To undertake a preliminary assessment of human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.4 and the assumptions and qualifications contained throughout the Report.

To complete the objectives, GHD undertook the following:

– Drilling and soil sampling of 15 on-site soil bores.
– Installation of one on-site groundwater monitoring well and five off-site groundwater monitoring wells.
– One groundwater monitoring event (GME) comprising seven on-site wells and five off-site wells.
– Stormwater sampling at seven on-site locations.
– Sediment sampling at five on-site locations.

The following conclusions were made following the DSI:

– There are PFAS impacts identified in soil, groundwater, stormwater and sediment on-site which can be attributed to the historical use of PFAS containing AFFF.
– No exceedances of human health guidelines have been identified in soil at the site for a commercial /industrial setting, and furthermore, impacted soils are overlain by hardstand which prevents direct contact.
– The presence of hardstand across the site and lack of vegetation precludes the direct contact ecological pathway for soil at the site.
– Soil leachability analysis suggests the shallow soils beneath the site are potentially an ongoing source of PFAS impacts to groundwater although the amount of infiltration through surface materials (hardstand) and potential flux to groundwater is unknown.
– On-site groundwater wells reported exceedances of the drinking water, recreational and ecological adopted assessment criteria.

- PFAS impacted groundwater has migrated off-site, generally in the inferred groundwater flow direction (north-west) and exceeds the applied drinking water guidelines at monitoring well locations MW03 (approximately 70 m down-gradient to the north-west) and MW05 (approximately 50 m cross-gradient to the west). The concentrations are noted to be three to four orders of magnitude lower than those on-site and are therefore not expected to extend a significant distance in concentrations above the criteria.
- A Section 83A notification was submitted to the SA EPA via email on 12 December 2022, in accordance with the South Australian Environment Protection Act 1993, for the off-site wells MW03 in Roper St and MW05 in Chancery Ln and to up-date the previous Section 83A notification for the on-site wells.
- PFAS impacted groundwater is not expected to impact human health via drinking water given the groundwater is not suitable for consumption (measured TDS > 1200 mg/L), the presence of a reticulated water supply and the absence of groundwater bores for extraction purposes down-gradient from the site.
- PFAS impacted groundwater is not expected to impact human health via recreational use given the concentrations in off-site monitoring wells do not exceed the guideline, and furthermore, the nearest surface water body (River Torrens (Karrawirra Parri) is located approximately 1,300 meters down-gradient from the site and does not allow recreational activities.
- PFAS impacted groundwater beneath the site exceeded the applied ecological criteria for freshwater, however, PFAS concentrations in groundwater sampled from off-site well locations were below the criteria and decreasing significantly with increasing distance from the site. It was considered likely that ambient concentrations of PFAS are present within highly modified urban waterways such as the River Torrens (Karrawirra Parri), however this has not been established.
- Stormwater sampling across the site identified exceedances of the adopted drinking water, recreational and ecological assessment criteria however there were no direct discharges to recreational waterbodies, interaction with the drinking water supplies or nearby significant ecological receptors. Although exceedances exist in stormwater sampled at the site, significant dilution would occur during transport to a human health or ecological receptor due to the distance (several kilometres) and other stormwater inputs. It is also likely that ambient PFAS concentrations exist in an urban stormwater system however this has not been determined.

The following data gaps remain following the completion of the DSI:

- Potential PFAS impacts in nearby surface water bodies (site sourced or ambient) are not currently known.

Table of Abbreviations

Abbreviation	Full form
AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ASC NEPM	*National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013*
COC	Chain of Custody
COPC	Chemicals of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQOs	Data Quality Objectives
EC	Electrical Conductivity
GAR	South Australian *Guidelines for the Assessment and Remediation of Site Contamination 2019*
GHD	GHD Pty Ltd
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
IP	Interface Probe
JSEA	Job Safety and Environment Analysis
LDPE	Low-Density Polyethylene
LOR	Limit of Reporting
m bgl	Metres Below Ground Level
MFS	South Australian Metropolitan Fire Service
mg/L	Milligrams / Litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan Version 2.0 - January 2020
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
ORP	Oxidation-Reduction Potential
PFAS	Per- and Poly-Fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
ppm	Parts Per Million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
SA EPA	South Australian Environment Protection Authority
SAQP	Sampling and Analysis Quality Plan
SOP	Standard Operating Procedure
SWL	Standing Water Level

Abbreviation	Full form
TDS	Total Dissolved Solids
TOC	Top of Casing
TOPA	Total Oxidisable Precursors Assay
WQEPP	South Australian *Environmental Protection (Water Quality) Policy* 2015
µg/L	Micrograms / Litre
µS/cm	MicroSiemens / centimetre

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1. Introduction

GHD Pty Ltd has been engaged by the Metropolitan Fire Service (MFS) to complete a Detailed Site Investigation (DSI) at the MFS Adelaide Station (the site). The site is located at 99 Wakefield Street, Adelaide SA 5000. The site location is outlined in Figure 1, at the end of this report.

1.1 Background

Historically, the MFS has used aqueous film-forming foams (AFFF) containing PFAS at the site during training activities. Foams containing PFAS have not been used at the site since 2016.

In 2016 and 2017, GHD completed limited investigations of the PFAS impacts in on-site soil and within the on-site drains and dam (sediment and surface water). PFAS contamination in soil, surface water, sediment and groundwater were identified but not delineated. It was also concluded that the concrete walls of the dam were likely contributing to PFAS impacts in the retained water.

In July 2021, GHD completed a groundwater investigation, including the sampling and analysis of six existing groundwater monitoring wells to determine the nature and extent of on-site groundwater PFAS impacts. The investigation identified the presence of PFAS contamination in groundwater, however, the extent of the impact was not delineated. It was considered that the PFAS-impacted groundwater would likely extend off-site with the potential to impact downgradient groundwater users and ecological receptors.

The site has been deemed by the EPA as a Level 2 regulatory priority in accordance with the EPA Site Contamination Regulatory and Orphan Site Management Framework (2017). This priority level assists the EPA to select the appropriate regulatory approach and reporting timeframe to manage site contamination effectively. In a letter dated 23 November 2021, SA EPA requested that a DSI and risk assessment be completed and provided to the EPA. A copy of the letter from SA EPA can be found in Appendix A This DSI has been conducted to address EPA's request.

1.2 Objectives

The objectives of this investigation are:

– To determine the nature and extent of PFAS site contamination, both on- and off-site.
– To assess the potential risks to human health and the environment associated with on-site PFAS contamination, in the context of continued industrial use.
– To undertake a preliminary assessment of potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.

1.3 Scope of Work

The following general scope of works were undertaken:

– Completion of a Sampling and Analysis Quality Plan (SAQP) (Appendix B).
– Advancement of 15 soil bores across the site and associated soil sampling and analysis for PFAS.
– Installation of six groundwater monitoring wells (one on-site, five off-site) and soil sampling at each location.
– One groundwater monitoring event (GME) of six newly installed and six existing groundwater wells.
– Stormwater sampling at seven locations (on-site and immediately off-site) via stormwater pits, drains and swales after a rainfall event.
– Stormwater sampling at five off-site locations inferred to be down gradient from the site. (stormwater pits, drains, ponds) after a rainfall event.
– Sediment sampling at five of the stormwater sampling locations (stormwater pits, drains).
– Surface water sampling at an on-site water retention dam.
– Preparation of this DSI report.

1.4 Limitations

This report: has been prepared by GHD for South Australian Metropolitan Fire Service and may only be used and relied on by South Australian Metropolitan Fire Service for the purpose agreed between GHD and South Australian Metropolitan Fire Service as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than South Australian Metropolitan Fire Service arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Site Description

2.1 Site Details

A summary of the details pertaining to the site is presented in Table 2.1 below.

Table 2.1 Summary of General Site Identification Information

Item	Detail
Site Address	99 Wakefield Street, Adelaide SA 5000
Certificates of Title	The site comprises land with the following Certificate of Title references: – CT5346/689. – CT5761/798. – CT5761/799. – CT5782/242. – CT5943/887. – CT5943/888. – CT6181/979.
Plan Parcels	The site comprises land with the following plan parcel references: – F181532AL690. – F181547AL705. – F181546AL704. – D112387AL80. – F181510AL668. – F181501AL659. – F16490AL7.
Current Zoning	Capital City (CC), City of Adelaide (mixed use of light industrial, commercial, and residential)
Property Owner	South Australian Metropolitan Fire Service
Current Site Use	Operational Fire Station
Area	13,601 m^2
Site Elevation	46 m AHD
Site surface	Observed to be relatively flat, with a gentle slope to the west (towards Chancery Lane). Majority of the site surface was sealed, with outdoor surfaces comprising pavers or concrete hardstand at ground surface. Small, unsealed garden bed areas exist in the central-northern, eastern and southern site boundaries. The sealed surfaces of the site were observed to be in good condition. Some sediment collection around stormwater drainage features was evident. No hydrocarbon staining, aside from minor staining in carpark spaces, was observed.
Site history	With relation to PFAS contamination, the use of the site as a fire station for more than 50 years has resulted in the wide-spread use of PFAS containing materials. A review of historical aerial photographs included in the GHD 2017a MFS Wakefield Street PSI indicates that the current site layout was constructed in 1985, with development occurring between 1968 and 1985. Some site investigations surrounding the use of AFFF across the site have been undertaken and are outlined in Section 4. Prior to 1968 it is unclear if historical site use has impacted PFAS contamination at the site.

The information in Table 2.1 above has been obtained through the South Australian Property and Planning Atlas (viewed 18 July 2021) and a GHD site inspection in July 2022.

2.2 Surrounding Land Use

A summary of the land uses surrounding the site is provided in Table 2.2 below.

Table 2.2 Summary of Surrounding Land Use

Direction	Land Use
North	Land use immediately to the north of the site (bound by Wakefield Street) is classified as public and commercial use with businesses including The Wakefield Hotel, Torrens University Australia, Mr Bulgogi Korean Restaurant, and multi-storey car parking. Hindmarsh Square (Mukata) is also located approximately 500 m to the north of the site. The River Torrens (Karrawirra Parri) is the nearest surface water body, and is located approximately 1.3 km to the north of the site.
East	Commercial properties are located immediately to the east of the site. Residential properties are located approximately 875 m to the east and south of Pulteney Street. Victoria Park (Pakapakanthi) is located 1 km to the east of site.
South	The South Australian Police (SAPOL) Headquarters are located on Angas Street, immediately adjacent to the southern boundary of the site. The Calvary Adelaide Hospital borders the south-eastern boundary of the site. Further south of Angas Street, land use is both commercial and residential. Public open space (for sporting and recreational activities) is located approximately 1 km south of the site within the Adelaide Parklands.
West	Commercial properties are located immediately to the west of the site. Educational facilities, including St Aloysius College and Chancery Lane Montessori Preschool are located immediately beyond Chancery Lane, approximately 100 m west of the site. Victoria Square (Tarntanyangga) is located approximately 500 m west of the Fire Station. The Adelaide Parklands, including Park 23 and the West Terrace Cemetery, is located approximately 1.5 km west of the site. Stormwater from the site is understood to discharge to a drainage channel in Park 23.

It is noted that historically, a Mitsubishi service centre was located hydraulically upgradient on the land immediately south of the site, now occupied by the South Australian Police (SAPOL) Headquarters and the Calvary Adelaide Hospital.

2.3 Regional Topography and Drainage

The land surrounding the site is relatively flat and forms part of the Adelaide Plains between Gulf St Vincent to the west and the Mount Lofty Ranges to the east. Surrounding areas of the site have an elevation of approximately 45 to 50 m Australian Height Datum (AHD), with the land surface sloping gently to the west.

The surrounding land within the Adelaide Central Business District (Adelaide CBD) is largely covered with sealed surfaces (hardstand, bitumen, etc.), with the majority of stormwater discharging to the Adelaide Parklands to the west via the stormwater drainage pipes throughout the Adelaide CBD.

2.4 Regional Geology

A desktop search using the South Australian Resources Information Gateway (SARIG) map layers catalogue (1:100,000 Surface Geology Map – Adelaide, viewed 20 July 2022) indicated that surface geology at the site and surrounds comprises Pleistocene-aged alluvial/fluvial sediments of the Keswick Clay formation (Qpas) within the St Vincent Basin. The surficial soils are anticipated to consist of smectite-rich, grey-green clays, with red or yellow mottling and rare sand lenses.

2.5 Regional Hydrogeology

According to the Department of Water, Land and Biodiversity Conservation (DWLBC) Report (Gerges 2006), the site lies within 'hydrogeological zone 4', which contains up to three Quaternary and two Tertiary aquifers, and a fractured rock aquifer. Each Tertiary aquifer consists mainly of thin layers of fine sand with low yield. Most of the Quaternary and Tertiary aquifers become thin, shallow, and interconnected in the vicinity of the River Torrens

(Karrawirra Parri). The shallow fractured rock aquifer near the River Torrens (Karrawirra Parri) contains groundwater of low salinity and significant yield.

A search of the SARIG database reported shallow groundwater in the site and surrounds to range from 5 m below ground level (bgl) to 15 m bgl. Salinity of groundwater in the region is reported to range from 1,500 to 3,000 mg/L total dissolved solids (TDS) indicating fresh to brackish water with a reported yield of 0.5 L per second to 2.5 L per second.

2.6 Site Hydrogeology

Groundwater at the site lies within a sandy clay layer with standing water levels measured between 11.69 to 13.16 m bgl on site. The aquifer is considered to be semi-confined by a layer of clay overlying the sandy clay aquifer.

Contouring of groundwater elevations indicated a north-western groundwater flow direction towards River Torrens (Karrawirra Parri). The groundwater contour elevations in m AHD can be found in Figure 5. This is consistent with the topography of the area and the suspected regional groundwater flow of the surrounding area.

2.7 Registered Bore Survey

The South Australian Water Connect database (DEW 2021) was accessed in May 2022 to conduct a search of registered groundwater wells located within a 2 km radius of the site.

A total of 1,423 registered groundwater wells were recorded within 2 km of the site. Of these, 768 had data listed for registered purposes, and are summarised as follows:

- 13 wells were identified as having domestic purpose (potentially extractive).
- 96 wells were identified as having drainage purpose.
- 16 wells were identified as having environmental purpose.
- 1 well was identified as having environmental/recreational purpose (potentially extractive).
- 16 wells were identified as having exploration purpose.
- 1 well was identified as having exploration/observation purpose.
- 435 wells were identified as having investigation purpose.
- 2 wells were identified as having investigation/managed aquifer recharge purpose.
- 3 wells were identified as having investigation/monitoring purpose.
- 4 wells were identified as having irrigation purpose (potentially extractive).
- 1 well was identified as having investigation/stock watering purpose (potentially extractive).
- 2 wells were identified as having managed aquifer recharge purpose.
- 112 wells were identified as having monitoring purpose.
- 55 wells were identified as having observation purpose.
- 1 well was identified as having observation/recreational purpose (potentially extractive).
- 1 well was identified as having observation/stock watering purpose (potentially extractive).
- 5 wells were identified as having recreational purpose (potentially extractive).
- 4 wells were identified as having town water supply purpose (potentially extractive).

Usage/purpose information was not registered for the remaining 655 wells within the 2 km radius enquiry area.

Total Dissolved Solids (TDS) data was available for 291 wells within the 2 km radius from the site. Of these, 80 wells had recorded TDS data values below 1,200 mg/L. The lowest TDS value of 171 mg/L was reported for well number 6628-329, located approximately 420 m south-west of the site and is not expected to interact hydraulically with the site.

The location of groundwater wells in the vicinity of the site with potentially extractive uses have been reviewed in the GHD Preliminary Site Investigation Report. All extractive wells within a 2 km radius of the site appear to be in close proximity of the Adelaide Parklands surrounding the CBD. The closest extractive groundwater wells to the

site are 6628-555 (approximately 750 m south of the site) and 6628-16184 (approximately 850 m east of the site). No extractive wells were listed NW of the site, however a number of wells of unknown purpose were noted between the Torrens River (Karrawirra Parri) and approximately 700 m NW of the site. Limited information was available regarding these wells and they are all located within the footprint of large multistorey buildings. These are considered likely to have supported investigation or construction activities for underground structures. Given the assumed use of the wells, these wells are not considered to pose a risk to human health via extraction of groundwater.

2.8 Site Drainage and Hydrology

The site exhibits raised ground surface on the eastern portion and slopes towards a surface drain running east-west between the Main Building and No.2 Engine Room. It is understood that the drain connects to a stormwater drain which leads out onto Wakefield Street, north of the site. The western portion of the site (east of the Special Operations and Training Tower) has surface drains running north-south with an inlet located north of the Logistics Building. It is understood that this drain also leads out to Wakefield Street.

Additionally there are basement ejector pits for subsoil and building stormwater located in the centre basement carpark and south-eastern area of the carpark. The subsoil and wastewater connects to sewer, which leads out to Wakefield Street. Based on surrounding topography, stormwater on site is likely to flow in a westerly direction and eventually run to Park 23 (as outlined in Figure 1). The fate of stormwater following discharge from Park 23 is unknown.

One dam was observed during the GHD 2017 investigation works. The dam is located in the western portion of the site with water historically utilised for on-site training activities. MFS have informed GHD that the dam dimensions are 2 m long, 2 m wide and 8 m deep. The dam is still known to be on-site, however is capped with a lid and lined with concrete. the dam is no longer utilised for training purposes. The dam currently receives stormwater flow from the site and discharges to Chancery Lane when the dam overflows.

2.9 Site Geology

The Geological Survey Map of South Australia Department of Mines (1:250 000 scale) indicated that the site is within the Golden Grove Embayment having Quaternary Pleistocene calcrete in Bakara Soil with Ripon Calcrete at base, nodular and platy carbonate. On site encountered lithology is outlined in Section 7.1.1.

2.10 Historical use of AFFF

Based on the GHD PSI completed in 2017, two main areas were identified where AFFF was used in the past. The period, volume and types of AFFF used on site was not recorded, however it was stated that AFFF was used at the fire station until approximately 2007.

The two areas known to have used AFFF in the past are:

1. Inside wash down bay.
2. Inside the training tower.

Area 1 – inside Wash down bay

Training that used AFFF was undertaken in wash down bay at an unknown frequency. AFFF products entered the drain located in the centre of the engine room, leading to sewer from underground waste drain. Alternatively, it was blown off site towards the surface water drain, running east-west just north of the engine room. It was noted that AFFF would sometimes blow off-site onto Wakefield Street.

Area 2 – inside the Training Tower

Similar to Area 1, the frequency of AFFF using training in the Training Tower is unknown. AFFF products entered the drain located north of the Training Tower, leading to drainage on Chancery Lane.

While use of AFFF ceased around 2007, AFFF was stored on site until approximately 2014. Storage of the AFFF was reported to be in the chemical storage shed, just north of the logistics building.

3. Assessment Criteria

PFAS is the key contaminant of concern for this environmental investigation. As such, the assessment criteria relevant to the site were sourced from the following documents:

– HEPA, 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (NEMP 2.0).
– NHMRC, 2019, Guidance on Per and Polyfluoroalkyl (PFAS) in Recreational Water, National Health and Medical Research Council, Canberra 2019.
– NHMRC/NRMMC, 2011, Australian Drinking Water Guidelines 6, Version 3.6 Updated March 2021, National Water Quality Management Strategy, National Health and Medical Research Council and Natural Resource Management Ministerial Council, Canberra, 2021, (ADWG).

3.1 Soil

Table 3.1 below identifies the PFAS assessment criteria that have been adopted for the assessment of soil.

Table 3.1 PFAS Assessment Criteria - Soil

Exposure Scenario	Land Use	Sum of PFOS[1] and PFHxS[2]	PFOA[3]	Comments and Reference Document
Human health guideline values	Commercial / Industrial (HIL D)	20 mg/kg	50 mg/kg	PFAS NEMP 2.0 2020
Ecological indirect exposure	All land uses	0.14 mg/kg	-	PFAS NEMP 2.0. 2020 For intensively developed sites (such as the MFS's Adelaide Fire Station) with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg is appropriate.

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid

The NEMP 2.0 (Section 8, 2020) provides guideline values that are to be used to inform site investigations. The guidelines have been derived based on nationally agreed Australian processes.

The ecological guidelines have been applied to provide a preliminary assessment of potential ecological risks for organisms through direct and indirect exposure; however, as the NEMP 2.0 states, the indirect exposure value may be over-protective for a number of considerations, including where the area of exposed soil is too small to have any material impact on the food chain transfer to higher order organisms, or in areas where the contaminated area does not support high value foraging habitat, or secondary consumers are effectively absent from the site. The site is predominantly covered in hardstanding, which discourages the presence of higher order organisms such as birds and mammals. The site-specific characteristics justify the use of a higher value (0.14 mg/kg) as the trigger for a detailed investigation of risk.

The site use is that of a fire station and during the site inspection, and following a review of information provided by MFS, there was no evidence of potential food production on the site (i.e., fruit trees, vegetable gardens, chickens, etc.). The human health guideline values for commercial/industrial land uses are therefore also applicable to the site.

3.2 Groundwater, Stormwater and Dam

To assess the contamination status of groundwater at a site, the GAR (SA EPA, 2019a) provides a four-step process to determine the environmental values of groundwater and to determine if actual or potential harm to groundwater that is not trivial has occurred (Table 3.2).

Table 3.2 Four-Step Process for Determining Environmental Values of Groundwater

Process	Assessment
Step 1: Apply Table 3 of WQEPP (2015) Schedule 1, based on TDS ranges	Calculated TDS results for groundwater samples collected from the site in July 2021 ranged between 6,269 and 8,903 mg/L, indicating saline groundwater beneath the site that is suitable for use by primary industries for livestock watering and aquaculture for human consumption, but not suitable for recreation, potable use or irrigation of crops (SA EPA, 2019a). The groundwater data in the WaterConnect database (Step 3) indicates however that out of 291 wells with available TDS data, 80 wells reported TDS values below 1,200 mg/L.
Step 2: Assess and identify surface water bodies within a 2 km buffer of the site	Surface water bodies within 2 km of the site include the River Torrens (Karrawirra Parri), located approximately 1.3 km north of the site, and the Park 23 Creek (Adelaide Parklands), located approximately 1.5 km west of the site.
Step 3: Review registered groundwater users in the WaterConnect database	The registered bore search identified 1,423 registered bores within a 2 km radius of the site. Registered purposes (with number of wells in parentheses) were as follows: domestic (13), drainage (96), environmental (16), environmental/ recreational (1), exploration (16), exploration/ observation (1), investigation (435), investigation/ managed aquifer recharge (2), investigation/ monitoring (1), investigation/ observation (2), irrigation (4), investigation/ stock watering (1), managed aquifer recharge (2), monitoring (112), observation (55), observation/ recreation (1), observation/ stock watering (1), recreational (5), and town water supply (4). Usage/purpose information was not registered for 655 of the wells in the 2 km enquiry area.
Step 4: Application of the EPA recognised criteria for the most sensitive environmental value	Based on Steps 1-3, the most sensitive environmental values to be applied to the site are Health Recreational Water, Health Drinking Water and Aquatic Ecosystems (fresh).

The groundwater criteria have been selected to protect the most sensitive environmental values (i.e., Human Recreational Water, Health Drinking Water and Aquatic Ecosystems (fresh), as identified via the assessment outlined in Table 3.2. These criteria are summarised in Table 3.3.

The 2018 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) defines a highly disturbed system as an urban stream which receives road and stormwater runoff. Given that the River Torrens (Karrawirra Parri) and the west parklands Park 23 creek receive various inputs from stormwater, they can be considered to be a highly disturbed ecosystem. Additionally, as both are located within the Adelaide CBD they have been highly modified from the natural environment. Therefore, the 90% Species Protection value has been selected to assess the effects of PFAS chemicals on aquatic organisms. The 95% Species Protection value has also been applied to account for bioaccumulation of PFAS compounds in the environment.

Note that surface water and groundwater utilise the same criteria given the interaction between surface water and groundwater. Additionally, both groundwater and surface water may discharge to potential receptors, and as a result assessment of environmental values of the receptors needs to be captured in both groundwater and surface water assessment criteria.

Table 3.3 Adopted PFAS Interim Screening Criteria (Stormwater, Groundwater and Dam)

Exposure Scenario	PFOS[1]	PFHxS[2]	Sum of PFOS and PFHxS	PFOA[3]	Source
Health Recreational Water[4]	2.0 µg/L	2.0 µg/L	2.0 µg/L	10 µg/L	PFAS NEMP 2.0 (2020)
Health Drinking Water	0.07 µg/L	0.07 µg/L	0.07 µg/L	0.56 µg/L	PFAS NEMP 2.0 (2020)
Freshwater 90% Species Protection – Slightly to moderately modified ecosystems	2.0 µg/L	-	-	632 µg/L	PFAS NEMP 2.0 (2020)
Freshwater 95% Species Protection – Slightly to moderately modified ecosystems	0.13 µg/L	-	-	220 µg/L	PFAS NEMP 2.0 (2020)
Freshwater 95% Species Protection – Slightly to moderately modified ecosystems	0.13 µg/L	-	-	220 µg/L	PFAS NEMP 2.0 (2020)

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid
[4] Based on NHMRC (2019)

3.3 Sediment

In the absence of specific screening criteria for sediments in the NEMP 2.0 (2020), the PFAS NEMP HIL D soil criteria have been adopted for on-site sediments results. These are protective of commercial workers, and as such, these are conservative for intermittent exposure scenarios (See Table 3.4).

Table 3.4 Adopted PFAS Human Health Assessment Criteria – Sediment

Exposure Scenario	Land Use	Sum of PFOS[1] and PFHxS[2]	PFOA[3]	Comments and Reference Document
Human health guideline values	Commercial / Industrial (HIL D)	20 mg/kg	50 mg/kg	PFAS NEMP 2.0 2020

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid

4. Historical Investigations

The following environmental investigations have previously been completed by GHD in relation to the site:

– GHD, 2017a, South Australian Metropolitan Fire Service, Preliminary Site Investigation, 99 Wakefield Street Adelaide, Investigation of PFAS, January 2017.
– GHD, 2017b, South Australian Metropolitan Fire Service, PFAS Investigation, June 2017.
– GHD, 2017c, PFAS Investigation – Additional Testing, Wakefield Street Fire Station, December 2017.
– GHD, 2021, Adelaide Fire Station Groundwater PFAS Assessment, South Australian Metropolitan Fire Service.

Summaries of each investigation and the findings/recommendations are presented below.

4.1 GHD (2017a) Preliminary Site Investigation

The Preliminary Site Investigation (PSI) scope included a desktop review of available current and historical information to assess the potential for PFAS contamination to exist, with subsequent targeted sampling in October 2016 that comprised:

– Limited soil sampling from three shallow soil bore locations (BH1-BH3) advanced by hand auger below the paved site surface. The soil bores were located adjacent to surface water inlets to assess surface water runoff impact to the soil in three locations: east of the chemical storage shed, south of Special Operations building and within the washdown bay. Samples were collected from shallow depths, approximately 0.1 – 0.4 m bgl.
– Two drain sediment samples: SED1 collected from the drain inlet of BH2 and SED2 collected from the washdown bay drain.
– Two storm water samples: SW01 collected from the surface water inlet located east of the chemical storage shed and SW02 collected from the washdown bay drain.

The findings of the PSI are summarised as follows:

– Several potential sources of PFAS were identified:
  - The washdown bay for washing of vehicles and hoses, and drainage associated with the training using AFFF at the fire station until 2007.
  - The training tower in the north-west corner of the site, where foam was historically discharged during fire training in this area.
  - Chemical storage shed located in the southern portion of the site with the storage of AFFF up to 2014.
– PFAS contamination was identified in all samples of soil, sediment and surface water collected and analysed as part of the PSI.
– The assessment criteria used in the 2017 PSI was the WA Government, Department of Environmental Regulation (WA, DER 2016) Interim Guideline on the Assessment and Management of PFAS. However, this guidance was superseded by the NEMP 2020 and NHMRC, 2019 guidelines (outlined in Section 3).
– The subsurface soil results reported elevated PFAS concentrations exceeding either the NEMP 2020 ecological direct and/or indirect exposure criteria for PFOS in sample BH2_0.08-0.18 located adjacent to the surface water inlet running off from the training tower. The soil PFAS impacts have not been vertically or laterally delineated.
– The soil leachate results in one soil sample analysed (BH1_0.08-0.18) reported high leachable concentrations of PFOS (1.98 µg/L) above the NEMP 2020 freshwater criteria for 95 % species protection - slightly to moderately modified ecosystems, and for sum of PFOS and PFHxS (2.16 µg/L) exceeding the NEMP 2020 criteria for drinking water (0.07 µg/L) and NHMRC 2019 Recreational Water PFAS Guidelines (2 µg/L sum of PFOS and PFHxS).
– The surface water PFAS concentrations (sum of PFOS and PFHxS 25.4 µg/L in SW01 and 6.12 µg/L in SW02) exceeded the adopted NEMP 2020 human health criteria for drinking water and NHMRC 2019 Recreational Water (2 µg/L), indicating that water may present an unacceptable risk to human health and to ecological receptors.

Based on the above findings GHD (2017a) recommended the following:

– Conduct an inventory of the site to confirm the presence of any PFAS containing AFFF product.
– Conduct tests of fire truck tank water to assess whether residual PFAS resides in the trucks.
– Conduct assessment of the nature and extent of groundwater contamination at the fire station through the installation of groundwater monitoring wells.
– Investigation of potential off-site surface water and groundwater contamination and potential risk to human health and ecological receptors.

4.2 GHD (2017b) PFAS Investigation

GHD (2017b) investigations completed in May-June 2017 included the following sampling:

– Sediment sampled from wastewater drains: SED1 from the training tower stormwater drain inlet and SED2 from the washdown bay drain inlet.
– Surface water sampled from the water storage dam: from surface of dam (DAM_S) and from bottom of dam (DAM_B). The water from the dam was utilised in training exercises at the site.

The results are summarised as follows:

– The drain sediment samples PFOS concentration exceeded the adopted NEMP 2020 ecological indirect exposure criteria for PFOS.
– The dam water samples sum of PFOS and PFHxS concentrations (2.63 - 2.83 µg/L) exceeded the adopted NEMP 2020 human health criteria for drinking water (0.07 µg/L) and the Recreational Water criteria (2 µg/L), as well as freshwater (95 % species protection - slightly to moderately modified ecosystems) criteria (0.13 µg/L for PFOS), indicating that, depending on its use, the water may present an unacceptable risk to human health and ecological receptors.

GHD (2017b) concluded that the dam water and sediments provided a potential direct exposure mechanism to human and terrestrial biota and a potential source for groundwater contamination. The findings resulted in an additional investigation and eventual closure of the dams (outlined in Section 4.3).

4.3 GHD (2017c) PFAS Investigation – Additional Testing

GHD (2017c) investigations completed in September and October 2017 included the following sampling:

– Sediment sample collected from an on-site drain south of Training Tower: DRAIN_S.
– Water samples collected from the on-site water storage dam after flushing / pressure cleaning: shallow water sample (DAM_S) and the deeper bottom water sample (DAM_B), to assess whether cleaning of the dam had made any significant impact to the level of PFAS. PFAS containing water was disposed appropriately.

The results are summarised as follows:

– The drain sediment sample PFOS concentration exceeded the adopted NEMP 2020 ecological indirect exposure criteria for PFOS.
– The dam water samples PFAS concentrations (sum of PFOS and PFHxS) ranged from 1.56 and 1.94 µg/L, exceeding the adopted NEMP 2020 human health criteria for drinking water (0.07 µg/L) and human health criteria for freshwater (95 % species protection - slightly to moderately modified ecosystems - 0.13 µg/L for PFOS), indicating that water may present an unacceptable risk to human health and ecological receptors given that water from the dam was utilised for training exercises at the site. Additionally, runoff and stormwater discharge following the training may impact offsite ecological receptors. After the pressure cleaning of the dams, PFAS concentrations in the water were reduced by about half and were below the Recreational Water criteria.

GHD (2017c) concluded that the unsealed concrete walls of the dam were acting as an ongoing source of PFAS to the retained water. The TOPA PFAS results indicated an increasing trend of Sum of PFHxS and PFOS in shallow water samples, indicating the presence of compounds which represent the potential for ongoing PFAS contamination.

The dam has since been closed and is no longer used for training and aerosolising water. It has been used as a stormwater retention pit.

4.4 GHD (2021) Groundwater PFAS Assessment

An environmental investigation at the Adelaide Fire Station was undertaken to determine if PFAS associated with historical use of AFFF were present in groundwater beneath the site. An updated WaterConnect search was also conducted (2 km radius), with a review of surrounding land use.

Groundwater samples were collected from six on-site wells which were, submitted to the laboratory and analysed for PFAS (Short Suite). Wells were installed on the site in 2020 by TMK Consulting Engineers.

The 2021 Groundwater PFAS Assessment reported elevated PFAS concentrations in all six groundwater monitoring wells, with the results summarised as follows:

– Standing water levels ranged from 11.528 mb TOC (GW102) to 13.168 mb TOC (GW104) with a groundwater flow inferred toward the north-westerly direction.
– PFOS and Sum of PFHxS and PFOS concentrations exceeded the adopted criteria (NEMP Recreational Water, NEMP Health Drinking Water) in four wells (GW101, GW103, GW104 and GW106).
– The elevated PFAS concentrations at wells GW101 (in the centre of the site) and GW103 (most down-hydraulic gradient well) were one to three orders of magnitude higher than in the other four wells and also exceeded the adopted health drinking water criteria for PFOA, the recreational criteria for PFHxS, PFOS and the Sum of PFHxS and PFOS and the ecological freshwater (95% species protection level) criteria for PFOS.
– Monitoring well GW101 reported the highest PFAS concentrations across the site, which was consistent with the historical use of PFAS containing foam in firefighting training at the nearby wash down bay.
– Elevated PFAS concentrations at GW103 were also consistent with a south-north flowing drain historically receiving runoff from the flushing of firefighting foam from hoses and pumps after their use at fire incidents and most down-hydraulic gradient location of this well.

Conclusions / recommendations / data gaps presented as part of the 2021 Groundwater PFAS Assessment included:

– The primary source of PFAS contamination no longer exists, however secondary sources of PFAS contamination remain and include contaminated soil, stormwater and groundwater.
– The soil dry weight and leachate results reported elevated PFAS concentrations exceeding the nominated ecological and human health criteria and continue to represent an ongoing source of PFAS. The soil PFAS impacts have not been vertically or laterally delineated on-site.
– The concrete walls of the dam are likely to be contributing dissolved PFAS concentrations to the retained water.
– The surface water and sediments may present a direct exposure mechanism to humans and the environment and an immediate potential source for groundwater contamination.
– The results suggest that the historical use of AFFF containing PFAS at the site has resulted in PFAS contamination to groundwater. Elevated PFAS concentrations were reported in groundwater sampled from all six on-site monitoring wells, with four wells exceeding the adopted the NEMP Health Drinking Water criteria.
– The reported PFAS concentrations in groundwater beneath the site were noted to constitute harm to groundwater that is not trivial. A Section 83A notification was submitted.
– It was considered that the impacted groundwater could potentially reach the River Torrens (Karrawirra Parri) and the west parklands Park 23 creek at concentrations above the adopted ecological assessment criteria for freshwater (95% species protection level).
– It was recommended that further soil and groundwater investigations be undertaken to assess the on-site soil contamination and extent of off-site impacts to groundwater.

5. Preliminary Conceptual Site Model

A conceptual site model (CSM) is a qualitative analysis tool which identifies the contamination sources, transport mechanisms, exposure pathways and receptors considered in a site-specific risk assessment. For a potential risk to exist, an exposure pathway must be present which requires each of the following to be identified:

– Presence of substances that may cause harm (SOURCE).
– Presence of a receptor which may be harmed (RECEPTOR).
– Existence of a means of exposing a receptor to the source (EXPOSURE PATHWAY) and whether exposure pathways are complete or incomplete.

A site-specific CSM has been developed based on GHD's understanding of the site setting, including geology, hydrogeology and surrounding land use in order to identify potentially significant source-pathway-receptor (SPR) linkages with respect to the potential risks in relation to the PFAS impacts at the site.

A tabular Conceptual Site Model (CSM) for the site, reviewed and updated as part of this SAQP, is presented in Table 5.1 below.

Table 5.1 Conceptual Site Model

Potential Source	Receptor	Pathway	Pathway Present?	Comments
PFAS-impacted soil, sediment and concrete.	Firefighters and workers at the MFS site.	Incidental ingestion of contaminated soil or concrete dust.	Very unlikely	PFAS concentrations detected in soil and sediment on-site to date were below the applicable Tier 1 assessment criteria for the protection of human health. PFAS concentrations in concrete are not known; however, concrete infrastructure across the site has a potential for being contaminated by PFAS based on the historical widespread use of PFAS-containing AFFF. If concrete dust is generated from works undertaken at the site it is possible that inhalation of dust may be a pathway to impact the human health environmental value.
	Ecosystem at, and immediately surrounding, the site	Direct or indirect exposure to contaminated soils or sediments.	Very unlikely	PFAS concentrations detected in soil and sediment exceeded the adopted Tier 1 interim ecological criteria for indirect exposure. Soil is currently overlain by brick hardstand on the site and is therefore unlikely to come into contact with ecological receptors.
		Migration of soils/sediments to surface water bodies via storm water.	Unlikely	The River Torrens (Karrawirra Parri) and the western Adelaide Parklands (including the Park 23 creek) are located approximately 1.3 km to the north (down-hydraulic gradient) and west of the site, respectively. The reported PFAS concentrations in soil and sediment exceeded the adopted ecological criteria and the soil contamination resulted in groundwater impact. It is unlikely that stormwater runoff is pushing sediments and soils through the stormwater system to surface water bodies given the distance to the nearest receptors.
	Groundwater beneath the site	Migration through soil.	Possible	PFAS leaching from impacted soil and sediment has resulted in groundwater contamination. While water used during training activities and rainfall is collected as surface runoff and transferred into the storage dam, some water may also infiltrate the ground and reach the groundwater.
PFAS-impacted surface/storm water (from drains & storage dam).	Firefighters and workers at the MFS site.	Direct dermal contact with contaminated stormwater	Unlikely	Limited testing of storm water from the drain / pit inlets, the washdown bay drain, and from the water storage dam has identified PFAS concentrations exceeding assessment criteria for the protection of human health (drinking water) and/ or recreational water criteria The surface water within the inlets is however not currently accessible by humans.

Potential Source	Receptor	Pathway	Pathway Present?	Comments
		Incidental ingestion of contaminated stormwater	Unlikely	The on-site dam has been closed and is no longer used for training and aerosolising water. It is currently only used as a stormwater retention pit.
	Ecosystem at, and immediately surrounding, the site	Stormwater runoff from site discharging to freshwater environments.	Possible	Limited on-site surface water testing has identified PFAS concentrations exceeding ecological criteria. The River Torrens (Karrawirra Parri) and the western Adelaide Parklands (including the Park 23 creek) are located approximately 1.3 km to the north (down-hydraulic gradient) and west of the site, respectively. As outlined in Section 0, stormwater from the site is discharged via stormwater drains to Park 23 where it is retained. The fate of Park 23 stormwater discharge is unknown and therefore cannot be confirmed that there is no impact to the environmental values of nearby aquatic systems. The distance to these receptors and dilution occurring during transport via stormwater drains would likely reduce concentrations discharging to the receptor.
	Recreation use of surface water bodies	Incidental ingestion of surface water	Unlikely	The closest water body is the River Torrens (Karrawirra Parri), which is not used for swimming. Water activities (boating etc.) undertaken on the River Torrens (Karrawirra Parri) are unlikely to result in consumption of impacted water at volumes that would pose a health risk from PFAS.
	Groundwater beneath the site	Surface/storm water infiltration	Unlikely	While storm water is collected as surface runoff and transferred into the storage dam, some water may also infiltrate the ground and reach the groundwater. However, given the depth to groundwater this is considered unlikely
PFAS-impacted groundwater.	People using groundwater for: domestic and drinking purposes.	Consumption of contaminated groundwater.	Possible	Although it is considered unlikely that groundwater would currently be used for potable purposes within the Adelaide CBD due to presence of reticulated water supply, some domestic bores have been identified within a 2 km radius of the site and potable use cannot be ruled out.
	People using groundwater for: irrigation of vegetable gardens and / or fruit trees with which they grow produce for consumption.	Consumption of fruit and vegetables irrigated by contaminated groundwater.	Unlikely	Although some domestic / irrigation bores were located within a 2 km radius of the site, it is considered unlikely that groundwater would currently be used for the irrigation of substantial areas of fruit and vegetables within the Adelaide CBD, particularly due to presence of reticulated water supply,

Potential Source	Receptor	Pathway	Pathway Present?	Comments
	People using groundwater for recreational purposes such as filling of swimming pools.	Incidental ingestion of contaminated groundwater.	Unlikely	Groundwater use for recreational purposes such as filling of swimming pools is considered unlikely. The closest water body is the River Torrens (Karrawirra Parri), which is not used for recreational swimming. Water activities (boating etc.) undertaken on the River Torrens (Karrawirra Parri) are unlikely to result in consumption of impacted water at volumes that would pose a health risk from PFAS.
	Down gradient off-site maintenance workers that contact PFAS contaminated groundwater.	Direct dermal contact or incidental ingestion of contaminated groundwater.	Very unlikely	Whilst it is possible that off-site maintenance workers could incidentally ingest contaminated groundwater, it is unlikely that they will ingest quantities detrimental to their health. The depth to groundwater (approximately 12 mbgl) is also likely beyond the reach of most construction activities.
	Ecosystem of the River Torrens (Karrawirra Parri) and the Park 23 Creek (western Adelaide Parklands)	Migration via groundwater and discharge to surface water bodies.	Possible	The River Torrens (Karrawirra Parri) is located approximately 1.3 km to the north (down-hydraulic gradient). The reported PFAS concentrations in groundwater beneath the site exceeded the adopted Tier 1 ecological criteria by more than two orders of magnitude when sampled in 2021.

6. Assessment methodology

The assessment was undertaken in general accordance with the following guidelines and policy documents:

– HEPA, 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (NEMP 2.0).
– ANZG, 2018, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, online resource www.waterquality.gov.au/anz-guidelines, Australian and New Zealand Governments, updated 26 July 2021, (AWQG).
– Environment Protection (Water Quality) Policy 2015 (WQEPP), Version 1.7.2020, Government of South Australia, updated 2020.
– SA EPA, 2019a, Guidelines for the Assessment and Remediation (GAR) of Site Contamination, Environment Protection Authority, South Australia, November 2019.
– SA EPA,2019b, Guidelines for Regulatory Monitoring and Testing – Groundwater Sampling.

6.1 Sampling rationale

The rationale for the investigation program is detailed in Table 6.1, with reference to the potentially complete SPR linkages identified in the CSM and the associated gaps in the available dataset.

Table 6.1 Investigation rationale

Receptor	Potentially complete SPR linkage	Data gaps identified in the SAQP	Investigation scope
MFS workers	Direct contact with impacted soil	PFAS impacted soil has been identified beneath the site, however, the vertical and lateral extent of contamination has not been determined	The advancement of 15 on-site soil bores (BH05-BH18) and installation of one on-site groundwater well (MW01)
The aquatic ecosystems of the River Torrens (Karrawirra Parri) (1.4 km north) and the Park 23 (1.3 km west)	Migration via groundwater and discharge to surface water bodies	The extent to which PFAS in onsite soil is leaching and impacting groundwater has not been determined	
		The off-site and downgradient extent of PFAS contamination in the groundwater has not been determined	The installation of 6 offsite groundwater monitoring wells and the gauging and sampling of all new and existing onsite and offsite wells (12 in total)
	Stormwater runoff from site discharging to freshwater environments	The potential for PFAS contamination being transported off-site via surface water discharge to the north and west of the site has not been investigated	The collection of stormwater samples from on-site drains and pits
People living and/or working in the area surrounding the site	The use of extracted groundwater for domestic and drinking purposes	The off-site and downgradient extent of PFAS contamination in the groundwater has not been determined	The installation of 6 offsite groundwater monitoring wells and the gauging and sampling of all new and existing onsite and offsite wells (12 in total)

6.2 Field methodology

Investigation methodology for the various stages of the DSI field program are summarised in Table 6.2 below.

Table 6.2 DSI Field Investigation Methodology

Task	Methodology
General	Design and implementation of site- and task-specific Job Safety and Environmental Assessments (JSEAs) for each field mobilisation. These included identifying site-specific hazards. A Health, Safety and Environmental Management Plan (HSEMP) was produced prior to off-site works for groundwater well installation and sampling. Logistical organisation including obtaining the relevant permits and access requirements with MFS and other parties (i.e. Adelaide City Council for proposed off-site groundwater monitoring well installation works and subsequent sampling). Engagement of appropriate drilling, surveying, service locating, vacuum truck / non-destructive digging (NDD) and waste disposal contractors to undertake the intrusive works.
Intrusive Soil Investigations	GHD completed the intrusive soil investigations as follows: – Works were conducted in accordance with the requirements of the JSEA, permits and SAQP. – Clearance of all sample locations was undertaken by an accredited service locator. – Soil bores were drilled/advanced via a combination of concrete coring, hand auger and direct push drilling methodologies. – Where the direct push drilling methodology was used, high density polyethylene (HDPE) core liners were used to minimise the risk of PFAS cross-contamination. – Soil samples were collected from extracted soil cores by hand with a pair of clean nitrile gloves. When sampling directly from the hand auger, samples were taken from soil not in direct contact with the equipment surfaces. – Discrete soil samples were collected at each soil bore location from surface (immediately under hardstand) (0.0 – 0.2 m bgl), near-surface (0.3 - 0.5 m bgl) and at 1.0 m intervals thereafter, or where lithological changes were observed or vertical delineation of previously identified impacts were required. – Logging of the soil bores was undertaken by an environmental scientist to assess the underlying geology and contaminant indicators. Borehole logs can be found in Appendix F. – Soil samples were placed in laboratory-supplied jars and placed immediately in a chilled cooler and transported to the analytical laboratories under chain of custody documentation protocols and chilled conditions. – Drilling spoil was either returned to the bore or placed in drums, sealed and stored at an on-site location agreed with MFS until off-site disposal was arranged to a suitably licenced facility. – Collection of QA/QC samples including intra-laboratory duplicate, inter-laboratory duplicate (split) samples, and rinsate blanks.

Task	Methodology
Groundwater Monitoring Well Installation	Installation and development of groundwater monitoring wells was undertaken as follows: – Installation of six groundwater monitoring wells (1 on-site and 5 off-site) via direct push and solid flight auger. – Well permits were issued for each of the six installed wells by the Government of South Australia Department for Environment and Water. Well permits can be found in Appendix C. – Each location was assessed and cleared by an accredited service locator prior to the commencement of works. – Non-destructive digging (i.e., hand auger or vacuum truck methodology) was used as required to ensure safe initial borehole advancement in the vicinity of potential underground services. – Well installation depths were completed as per Table 7.3. – 50 mm Class 18 PVC casing was used for the well installation, with a 3 m slotted screen interval installed at the target depth. – Wells were constructed as per Minimum Construction Requirements for Water Bores in Australia (4th Edition, 2020). – Groundwater wells were developed via pumping or bailing after construction (where appropriate), with the well casing pumped out to remove loose sediment created by the drilling and construction process. Where possible, water physio-chemical parameters [electrical conductivity (EC), dissolved oxygen (DO), temperature, pH, oxidation/reduction potential (ORP), and turbidity] were measured and recorded in the field to confirm removal of any added water (if any) and stabilisation of parameters. – A licensed surveyor surveyed the location of each groundwater monitoring well to Australian Map Grid (AMG) coordinates to within 0.01 m. At the same time, the level of the measuring point was marked at the top of the well casing (as well as the adjacent ground surface) to Australian Height Datum (AHD) to within 0.001 m. The top of casing (TOC) elevation of the six existing on-site groundwater monitoring wells was also re-surveyed at this time to ensure there is a consistent survey data set. – Development and purge water was placed in drums, sealed, and stored at a location agreed with MFS until off-site disposal was arranged to a suitably licenced facility. – Groundwater sampling was completed following well development.
Groundwater Sampling	Groundwater sampling was undertaken as follows: – Gauging and inspection of monitoring wells was undertaken using an oil/water interface probe (IP) to measure standing water levels (SWLs) and total well depths. – Groundwater sampling was conducted using no flow sampling techniques (HDPE sleeve sampler), and included measurement of field parameters – pH, EC, DO, turbidity, ORP (corrected where required) and temperature.
Stormwater and Sediment Sampling	The following steps were undertaken as part of the stormwater and sediment sampling program: – Stormwater samples were collected directly into laboratory-supplied containers, with samples collected using an extendable sampling pole (telescopic/swing sampler) where required. – Field pH, EC, DO, turbidity, ORP (corrected where required) and temperature readings were unable to be taken given the limited flow of water at the sampling locations. – Sediment samples collected from the nominated pits and drains were collected when water levels were lowest. This was achieved using a small trowel, shovel and/or by hand using nitrile gloves. Sediment samples from deeper pits/drains, where a hand trowel was not suitable, were collected using a Van Veen Grab Sampler.
Dam sampling	The following steps were undertaken as part of the stormwater and sediment sampling program: – Dam samples were collected using an extendable sampling pole (telescopic/swing sampler) and decanted directly into laboratory-supplied containers – Samples were obtained from water near the surface of the dam and near the base of the dam.

Task	Methodology
Decontamination	**General guidance** Samples can be contaminated with PFAS from a range of products, including new clothing, footwear, PPE and treated fabrics stain and water-resistant products, sunscreen, moisturisers, cosmetics, fast food wrappers, polytetrafluoroethylene (PTFE) materials (such as Teflon©), sampling containers with PTFE-lined lids, foil, glazed ceramics, stickers and labels, inks, sticky notes, waterproof papers, drilling fluids, decontamination solutions and reusable freezer blocks. As such, these items were not worn or used during any stage of sampling (at site, during transport etc.). Where possible field sampling was undertaken by completing monitoring in areas where low concentrations of PFAS are likely and then moving toward wells of likely higher concentrations to reduce the chance of cross-contamination. **Handling** The following applied to the sampling program: – Sampling personnel washed their hands with plain soap and rinsed thoroughly in tap water. – Laboratory supplied sample containers suitable for the requested analysis LOR requirements were used. – Sampling and monitoring equipment that may contain PTFE (PTFE based compositions include Teflon®) were avoided during the sampling. – Teflon®-coated materials and aluminium foil did not come into contact with the samples. – Chemical or gel-based coolant products to keep samples cool were not used. – Recommended equipment for groundwater sampling such as HDPE sleeve samplers were utilised. – Consumable sampling equipment was not reused. – Decontamination techniques employed for this testing were carried out in accordance with GHD's SOPs.

6.3 Laboratory Analysis

Table 6.3 details the laboratory analytical program adopted for this DSI.

Table 6.3 Analytical schedule

Primary Samples		
Locations	**Samples analysed**	**Analysis Schedule**
Soil		
15 boreholes (BH04 – BH18)	55	55 x PFAS Suite[1]
Groundwater		
7 on-site wells (GW101 – GW106, MW01) 5 off-site wells (MW02, MW03, MW05 – MW07)	12	12 x PFAS Suite[1]
Stormwater		
7 locations (SW01, SW03, SW05, SW06, SW11, SW14, SW16)	7	7 x PFAS Suite[1]
Sediment		
5 locations (SED01, SED05 – SED07, SED11)	5	5 x PFAS Suite[1]
Dam		
1 location (DAM_S and DAM_B)	2	2 x PFAS Suite[1]
Quality Control Samples		
Intra-Laboratory Duplicate	9	9 x PFAS Suite[2]
Inter-Laboratory Duplicate	8	8 x PFAS Suite[2]
Rinsate Blank	8	8 x PFAS Suite[2]

1. Per- and poly fluoroalkyl substances (Perfluoroundecanoic acid (PFUnDA), Perfluorododecanoic acid (PFDoDA), Perfluorotridecanoic acid (PFTrDA), Perfluorotetradecanoic acid (PFTeDA), Perfluoropentane sulfonic acid (PFPeS), Perfluoroheptane sulfonic acid (PFHpS), Perfluorodecanesulfonic acid (PFDS), Perfluorooctane sulfonamide (FOSA), N-Methyl perfluorooctane sulfonamide (MeFOSA), N-Ethyl perfluorooctane sulfonamide (EtFOSA), N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA), N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE), N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE), N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA), 4:2 Fluorotelomer sulfonic acid (4:2 FTS), 8:2 Fluorotelomer sulfonic acid (8:2 FTS), 10:2 Fluorotelomer sulfonic acid (10:2 FTS), Sum of PFHxS and PFOS, PFAS (Sum of Total), PFAS (Sum of Total)(WA DER List)).

7. Assessment results

7.1 Soil

7.1.1 Field Observations

A summary of the on-site lithology encountered during drilling of the on-site 15 soil bores (BH05-BH18) and one on-site groundwater well (MW01) is included in Table 7.1. Copies of all soil bore logs are provided in Appendix F.

Table 7.1 Summary of lithology encountered

Soil Type	Depth Range (m bgl)	Description
Hardstand	0 – 0.18	Concrete
Fill	0.08 – 1.0	Gravelly SAND; pale brown, grey-brown and black, fine to coarse, slightly moist, loose No odour, no staining
Natural Unit 1	0.3 – 3.0	Sandy CLAY; brown, pale brown, grey and red, fine to coarse sand, low plasticity, slightly moist, firm to stiff No odour, no staining, brick, and concrete fragments throughout, primarily at 1.0 m bgl
Natural Unit 2	1.5 – 9.0	CLAY; grey-brown, medium plasticity, dry to slightly moist, stiff No odour, no staining
Natural Unit 3 (Aquifer)	9.0 – 13.0	Sandy CLAY; orange, brown with grey, low to medium plasticity, moist, firm No odour, no staining

7.1.2 Soil Analytical Results

Tabulated soil analytical results and leachability results for selected samples are provided in Tabulated Analytical Results Table 1 and Tabulated Analytical Results Table 2. Copies of laboratory certificates are provided in Appendix G. Soil sampling locations are presented in Figure 2.

A summary of soil samples which exceeded the adopted assessment criteria are summarised in Table 7.2 below and shown in Figure 3.

Leachability results are not directly comparable to available guidelines but have been presented on Tabulated Analytical Results Table 2 to provide context.

Table 7.2 Soil exceedances of adopted assessment criteria

Analyte	Location(s)	Sample depths reporting exceedances (m bgl)	Criteria exceeded	Concentration range (mg/kg)
PFOS	BH05	0.1 – 0.2 0.4 – 0.5 1.0 – 1.1	PFAS NEMP 2.0 2020 Ecological indirect exposure (0.14 mg/kg)	0.37 – 2.6
	BH06	0.4 – 0.5 1.0 – 1.1 1.6 – 1.7		0.38 – 0.7
	BH07	0.4 – 0.5 0.9 – 1.0 1.3 – 1.4		2.0 – 8.1
	BH08	0.1 – 0.2 0.4 – 0.5 1.0 – 1.1		0.2 – 0.99
	BH09	0.4 – 0.5 1.0 – 1.1 2.3 – 2.4		0.46 – 0.96
	BH12	0.1 – 0.2 0.4 – 0.5 1.0 – 1.1		0.4 – 4.5
	BH13	0.1 – 0.2 0.4 – 0.5		0.1 – 0.52
	BH14	0.1 – 0.2 0.4 – 0.5 1.6 – 1.7		0.24 – 0.66
	BH15	0.1 – 0.2		0.15
	BH16	0.4 – 0.5 1.0 – 1.1		0.16 – 0.33

7.2 Groundwater

7.2.1 Well installation details

A total of six monitoring wells were installed by GHD from 4 August 2022 to 17 September 2022. Installation details for the monitoring wells are provided in Table 7.3 below. The methodology followed for well installation is provided in Section 6. Groundwater well survey plans and bore construction licences are provided in Appendix C. The groundwater well survey report is provided in Appendix D

Table 7.3 Monitoring well installation details

Well ID	Easting (MGA55)	Northing (MGA55)	Top of Casing (m AHD)	Total Depth(m bgl)	Screening interval (m bgl)	Screened strata
MW01	281146.719	6132220.460	45.820	15.0	10 – 15	Sandy CLAY
MW02	280982.016	6132307.966	45.041	18.0	12 – 18	Sandy CLAY
MW03	281110.870	6132303.036	45.210	17.5	11.5 – 17.5	Sandy CLAY
MW05	281095.412	6132169.869	45.281	15.0	10 – 15	Gravelly CLAY
MW06	281237.719	6132074.370	46.390	14.5	8.5 – 14.5	Sandy CLAY
MW07	281382.455	6132228.308	47.540	16.0	10 – 16	Sandy CLAY

7.2.2 Field observations

7.2.2.1 Groundwater Gauging

A gauging round of all wells was completed prior to sampling. The results from this gauging round are summarised in Table 7.4 below. The field gauging data are provided in Appendix E. Locations of the monitoring wells can be found in Figure 4.

Table 7.4 Groundwater gauging results

Well ID	Top of Casing Survey Level (m AHD)	Depth to Groundwater (m bTOC)	Depth to Groundwater (m AHD)
MW01	45.820	11.960	33.860
MW02	45.041	17.525	27.516
MW03	45.210	11.873	33.337
MW05	45.281	11.50	33.781
MW06	46.390	12.10	34.29
MW07	47.540	13.55	33.99
GW101	46.463	12.655	33.808
GW102	45.656	11.688	33.968
GW103	45.894	11.90	33.994
GW104	47.07	13.155	33.915
GW105	45.933	11.99	33.943
GW106	46.463	12.46	34.003
MW03	45.210	11.873	33.337
MW05	45.281	11.500	33.781
MW06	46.390	12.100	34.290
MW07	47.540	13.550	33.990
GW101	46.463	12.655	33.808
GW102	45.656	11.688	33.968
GW103	45.894	11.900	33.994
GW104	47.070	13.155	33.915
GW105	45.933	11.990	33.943
GW106	46.463	12.460	34.003

Based on the contoured groundwater elevation results the site wide groundwater flow direction was toward the north-west. Groundwater contours are outlined in Figure 5.

7.2.2.2 Water quality parameters

A summary of the field parameters measured during groundwater sampling and observations made during sampling are presented in Table 7.5. Purge record sheets are provided in Appendix E.

Table 7.5 Stabilised field parameters

Well ID	Temp (ºC)	pH	EC (µS/cm)	DO (mg/L)	Corrected Redox[1] (mV)	Observations
MW01	20.3	6.46	12,441	0.68	276.3	None taken during monitoring
MW02	20.6	6.80	3,113	0.15	145.1	None taken during monitoring
MW03	19.5	6.68	7576	0.68	173.5	Clear, no odour, no sheen, low turbidity, low sediment load
MW05	21.0	6.59	13219	6.59	175.9	None taken during monitoring
MW06	20.2	6.26	11188	0.31		Pale brown, no odour, no sheen, medium to high turbidity, medium sediment load
MW07	19.6	6.23	9180	0.2		Pale brown, no odour, no sheen, medium turbidity, low to medium sediment load
GW101	19.9	6.64	8710	1.08	196.4	Pale yellow, no odour, no sheen, medium turbidity, low to medium sediment load
GW102	20	6.37	11349	0.25	204	Clear to pale brown, no odour, no sheen, low turbidity, low sediment load
GW103	20.9	6.38	14595	0.21	227.9	None taken during monitoring
GW104	-	-	-	-	-	Pale yellow to pale brown, no odour, no sheen, medium turbidity, low to med sediment load
MW03	19.5	6.68	7576	0.68	173.5	Clear, no odour, no sheen, low turbidity, low sediment load
MW05	21.0	6.59	13219	6.59	175.9	None taken during monitoring
MW06	20.2	6.26	11188	0.31		Pale brown, no odour, no sheen, medium to high turbidity, medium sediment load
MW07	19.6	6.23	9180	0.2		Pale brown, no odour, no sheen, medium turbidity, low to medium sediment load
GW101	19.9	6.64	8710	1.08	196.4	Pale yellow, no odour, no sheen, medium turbidity, low to medium sediment load
GW102	20	6.37	11349	0.25	204	Clear to pale brown, no odour, no sheen, low turbidity, low sediment load
GW103	20.9	6.38	14595	0.21	227.9	None taken during monitoring
GW104	-	-	-	-	-	Pale yellow to pale brown, no odour, no sheen, medium turbidity, low to med sediment load
GW105	20.2	6.59	9313	0.98	411.2	None taken during monitoring
GW106	18.9	6.31	10855	0.44	291.5	Clear to pale brown, no odour, no sheen, low turbidity, low sediment load

Notes:
1. Redox potential corrected to standard hydrogen electrode (SHE) using a correction factor of +205 mv.

Physio-chemical parameters indicated:

– pH was slightly acidic.
– Temperature varied between 18.9 ºC and 21.0 ºC.

– Electrical conductivity indicated generally brackish water with the exception of MW02. Regionally, electrical conductivity was observed to decrease towards the west. MW02 is the most westerly well within the monitoring network, therefore has the lowest electrical conductivity.
– Dissolved oxygen was low to very low, indicating an anaerobic system.
– Oxidation-reduction potential was reducing.
– Water was generally brown in colour, medium to high turbidity, with no odour or sheen.

7.2.3 Groundwater analytical results

Analytical results tables for groundwater are provided as Table 2 of Appendix G. Laboratory reports are provided in Appendix H. A summary of groundwater results which exceeded the adopted assessment criteria are summarised in Table 7.6 below.

Table 7.6 Groundwater criteria exceedances

Analyte	Locations	Criteria Exceeded	Concentration (µg/L)
Perfluorooctane sulfonic acid (PFOS)	Onsite: GW101, GW103	PFAS NEMP 2.0 2020 Freshwater – 90% - slightly to moderately disturbed systems 2.0 mg/L	9.4 – 22
Perfluorooctane sulfonic acid (PFOS)	On-site: GW101, GW103	PFAS NEMP 2.0 2020 Freshwater – 90% - slightly to moderately disturbed systems 2.0 µg/L	9.4 – 22
	On-site: GW101, GW103, MW01	PFAS NEMP 2.0 2020 Freshwater – 95% - slightly to moderately disturbed systems 0.13 µg/L	1.5 – 22
	On-site: GW101, GW103	PFAS NEMP 2.0 2020 Recreational Water 2.0 µg/L	9.4 – 22
Perfluorooctanoic acid (PFOA)	On-site: GW101	PFAS NEMP 2.0 2020 Health Drinking Water 0.56 µg/L	1.5
Sum of PFHxS and PFOS	On-site: MW01, MW03 Off-site: MW05 (west)	PFAS NEMP 2.0 2020 Health Drinking Water 0.07 µg/L	0.09 – 1.6
	On-site: GW101, GW103	PFAS NEMP 2.0 2020 Recreational Water 2.0 µg/L	14 – 41

7.2.4 Section 83A notification

The reported concentrations of PFAS in sampled on- and off-site groundwater monitoring bores were considered to constitute harm to groundwater. A Section 83A notification form was submitted in accordance with the South Australian Environment Protection Act 1993 (Gov SA 1993) to the SA EPA via email on 12 December 2022 for the off-site wells MW03 in Roper St and MW05 in Chancery Ln and to up-date the previous Section 83A notification for the on-site wells dated 30 July 2021 (GHD 2021).

A copy of the Section 83A notification form is provided in Appendix H.

7.3 Stormwater

Seven stormwater samples (shown in Figure 8) were collected during the investigation from on-site drains and pits. The samples were collected during a rain event on 12 August 2022 to determine if stormwater runoff leaving site via the storm system was impacted with PFAS. All samples were taken from water observed to be flowing in storm water swales, pits or drains to represent actual site discharge and not stagnant conditions. Of the 20 proposed surface water sampling locations, 13 were unable to be sampled due to low to no flow being observed. Additionally, no field parameters were taken during the sampling event due to limited sample volumes and opportunistic nature of sampling during a rain event. It should be noted that locations SW11 and SW03 were most representative of stormwater leaving the site during a rain event.

7.3.1 Stormwater analytical results

Analytical results tables for stormwater are provided in Tabulated Analytical Results Table 4. Laboratory reports are provided in Appendix G. A summary of surface water samples which exceeded the adopted assessment criteria is provided in Table 7.7 below.

Table 7.7 Stormwater criteria exceedances

Analyte	Locations	Criteria Exceeded	Concentration (µg/L)
Perfluorooctane sulfonic acid (PFOS)	SW01	PFAS NEMP 2.0 2020 Freshwater - 90% - slightly to moderately disturbed systems 2.0 µg/L	5.0
	All locations	PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems 0.13 µg/L	0.15 – 5.0
	SW01	PFAS NEMP 2.0 2020 Recreational Water 2 µg/L	5.0
Perfluorohexane sulfonic acid (PFHxS)	All locations	PFAS NEMP 2.0 2020 Health Drinking Water 0.07 µg/L	0.09 – 1.3
Sum of PFHxS and PFOS	SW03, SW05, SW11, SW14, SW16	PFAS NEMP 2.0 2020 Health Drinking Water 0.07 µg/L	0.40 – 5.2
	SW01, SW06	PFAS NEMP 2.0 2020 Recreational Water 2 µg/L	2.1 – 5.2

7.4 Sediment

7.4.1 Field observations

Sediment samples were collected during the surface water sampling event, with locations matching the corresponding surface water locations provided in Figure 8. Sediment samples were taken where possible to determine if PFAS was leaching and accumulating in the sediment of drains and pits.

7.4.2 Sediment analytical results

Analytical results tables for sediment samples are provided in Tabulated Analytical Results Table 5. Laboratory reports are provided in Appendix G. No sediment samples exceeded the adopted assessment criteria (HIL D), however did report results above the laboratory detection limit.

7.5 Stormwater Retention Dam/Pit

7.5.1 Field observation

Two samples from the on-site dam were collected on 25 October 2022. DAM_S was collected from the surface and DAM_B was collected from the base (approximately 8 m bgl).

7.5.2 Dam analytical results

Analytical results tables for sediment samples are provided in Tabulated Analytical Results Table 6. Laboratory reports are provided in Appendix G. A summary of surface water samples which exceeded the adopted assessment criteria is provided in Table 7.8 below.

Table 7.8 Dam criteria exceedances

Analyte	Locations	Criteria Exceeded	Concentration (µg/L)
Perfluorooctane sulfonic acid (PFOS)	DAM_S and DAM_B	PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems 0.13 µg/L	1.8
Perfluorohexane sulfonic acid (PFHxS)	DAM_S and DAM_B	PFAS NEMP 2.0 2020 Health Drinking Water 0.07 µg/L	0.58 – 0.59
Sum of PFHxS and PFOS	DAM_S and DAM_B	PFAS NEMP 2.0 2020 Health Drinking Water 0.07 µg/L	2.4
	DAM_S and DAM_B	PFAS NEMP 2.0 2020 Recreational Water 2 µg/L	2.4

8. Quality Assurance and Quality Control

A detailed Quality Assurance and Quality Control (QA/QC) assessment was completed for the analytical sample data, in order to determine whether it is of suitable quality on which to base the site assessment. Field quality control was assessed by collecting and analysing inter- and intra-laboratory duplicates, rinsate blank, and trip blank samples. The assessment of these field quality control samples is discussed in Appendix I.

Calibration certificates for field equipment used are provided in Appendix J.

Laboratory quality control and quality assurance was assessed by reviewing the laboratory provided quality assessment reports.

The QA/QC assessment found that the majority of GHD QA/QC Data Quality Indicators (DQIs) were within the specified requirements. The data are, therefore considered to be valid and of sufficient quality to rely on for the purpose and objectives of this assessment. A copy of the detailed QA/QC report is provided in Appendix I.

9. Discussion

9.1 Soil

The preliminary CSM identified that the soil dataset collected historically at the site was insufficient to understand the nature and extent of PFAS impacts in onsite soil. The potentially complete SPR linkages identified for onsite soil included:

– MFS workers coming into direct contact with soil impacts or dust.
– Soil impacts leaching and impacting groundwater, with potential implications of both the offsite users of extracted groundwater and the receiving surface water environment of Park 23.

The implications for the soil dataset collected during this investigation for each of these SPR linages is discussed herein.

9.1.1 Nature and extent of PFAS impacts in soil

The distribution of PFAS across the site is influenced by its former use of AFFF, with only three of the 15 boreholes reported PFOS concentrations greater than 1 mg/kg (BH05, BH07 and BH12). The borehole which reported the highest PFAS concentrations (BH07) targeted the historical PFAS AFFF storage area. BH07 reported PFOS concentrations ranging from 2.0 mg/kg to 8.1 mg/kg at depths between 0.4 mbgl to 1.4 mbgl, with concentrations being highest in shallow soils and decreasing with depth. Additionally, BH05 and BH12 which targeted a former training area reported the next highest PFAS concentrations. Similarly to BH07, the highest concentrations were identified near surface level, with concentrations decreasing with depth. Spillages and leakages from the AFFF storage facilities and use of AFFF in the training area has contributed to higher PFAS concentrations in the western portion of the site.

Concentrations of PFAS in soil appear to generally decrease laterally further away from the former AFFF storage area and training area in the western portion of the site, with concentrations of PFOS falling below 0.14 mg/kg at locations BH17 (eastern boundary of the site) and BH10 (northern boundary of the site) in all samples collected.

There is some variability in PFAS concentrations vertical distribution across the site. Concentrations of PFAS generally decrease with depth, however 8 of the 15 locations reported an increase in PFAS concentrations from the near surface samples (0.1 – 0.3 m bgl) to the deeper (0.4 – 0.6 m bgl) samples. As PFAS compounds are highly soluble in water, infiltration through soil during rain events causes surficial PFAS contamination to seep deeper into the soil profile. As the use of PFAS containing AFFF ceased around 2017, surficial concentrations of PFAS in soils gradually decreased over time as the PFAS migrates vertically due to rain water infiltration.

This is supported by soil leachability analysis which suggests the shallow soils beneath the site are potentially an ongoing source of PFAS impacts to groundwater although the amount of infiltration through surface materials (hardstand) and potential flux to groundwater is unknown.

While concentrations of PFAS compounds at the site are highest at and adjacent to the former AFFF storage and training areas, the distribution of PFAS concentrations across the site can be attributed to the widespread and consistent historical use of PFAS containing AFFF at the site.

No concrete or pavement sampling was undertaken during the DSI, however it can be assumed that this may be a source for PFAS compounds to leach into soil at the site.

9.1.2 Assessment of potential human health risk

Given the historical use of AFFF at the site, there have been administrative controls put in place to prevent to the cultivation of fruit and vegetables at all MFS sites and HIL D guidelines are considered the most appropriate to assess the potential risk to human health at the site. Exceedances of the PFAS NEMP 2.0 2020 Industrial / Commercial (HIL D) adopted assessment criteria have not been identified in any of the soil samples collected at the site to date. These results suggest that the onsite soil impacts represent a low and acceptable risk to MFS workers that may come into direct contact with soil and/or dust

The site surface is also predominately sealed with brick hardstand, reducing the potential for direct contact with PFAS impacted soils. The sample density and location of the boreholes in relation to known PFAS sources is considered sufficient to confirm the low likelihood of risk to human health at the site.

9.1.3 Assessment of potential ecological risk

The PFAS NEMP provides an ecological direct guideline value for PFOS in soil of 1 mg/kg. As the site is covered in brick hardstand and has no on-site vegetation, direct contact with PFAS compounds by ecological receptors is not considered a complete pathway.

The PFAS NEMP provides an ecological indirect guideline value for PFOS in soil of 0.01 mg/kg but states that '*for intensively developed sites with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg may be appropriate".* The 0.14 mg/kg value was sourced from the Environment and Climate Change Canada (ECCC, 2018) *Federal Environmental Quality Guidelines Perfluorooctane Sulfonate (PFOS)* and is the concentration in soil that is expected to protect against potential impacts on freshwater aquatic life from PFOS originating in soil that may enter the groundwater and subsequently discharge to a surface water body. At this site, this exposure pathway has been assessed using groundwater data. Further discussion on this can be found in Section 9.3.

9.2 Groundwater

The preliminary CSM identified that the off-site and downgradient extent of PFAS contamination in the groundwater has not been determined.

The potentially complete SPR linkages identified for groundwater included:

– The aquatic ecosystems of the River Torrens (Karrawirra Parri) and Park 23 being exposed to PFAS following the migration and discharge of groundwater to surface water.
– People living and/or working in the area surrounding the site using extracted groundwater for domestic purposes including recreation and/or drinking.

The implications for the groundwater dataset collected during this investigation for each of these SPR linages is discussed herein.

9.2.1 Nature and extent of groundwater impacts

Groundwater was encountered at and adjacent the site within a sandy clay layer between 11.5 and 18 m bgl for the newly installed groundwater wells (MW01 – MW03, MW05 – MW07). Standing water levels measured during groundwater sampling events ranged between 11.69 to 13.16 m bgl on site and 11.87 to 17.525 m bgl offsite. The aquifer is considered to be semi-confined by a layer of clay overlying the sandy clay aquifer.

Contouring of groundwater elevations indicated a north-western direction towards River Torrens (Karrawirra Parri). This is consistent with the topography of the area and the suspected regional groundwater flow of the surrounding area.

The highest concentration of PFAS were observed in GW101, located in the centre of the site. Concentrations of sum of PFHxS and PFOS were reported to be 41 µg/L, which was twenty times the PFAS NEMP 2.0 2020 recreational water adopted assessment criteria (2 µg/L) and several orders of magnitude above the Health Drinking Water adopted assessment criteria (0.07 µg/L). On-site wells GW103 and MW01 reported the next highest concentrations, with sum of PFHxS and PFOS concentrations reported at 14 µg/L and 1.6 µg/L respectively. These wells are also hydraulically downgradient of GW101, indicating that impacted soil and groundwater in the centre of the site may be acting as a source of PFAS contamination for downgradient wells. The remaining on-site wells (GW105, GW102, GW106, GW104) reported results below or at the laboratory detection limit.

Of the five off-site wells sampled during the GME, two (MW03 and MW05) reported exceedances of the PFAS NEMP 2.0 2020 Health Drinking Water assessment criteria for PFHxS and Sum of PFHxS and PFOS. Both wells reported concentrations within the same order of magnitude as the guideline threshold values. Down gradient monitoring well MW02 also reported detections of PFAS (although below the adopted assessment criteria), however this location is approximately 100 m west of MW03. All up-gradient monitoring wells reported results either at or below the detection limit, indicating that downgradient monitoring wells impacted by PFAS can be attributed to the site. A concentration heatmap which illustrates the PFHxS, PFOS and PFOA is provided on Figure 7.

9.2.2 Assessment of potential risks to human health

Exceedances of the PFAS NEMP 2.0 2020 Health Drinking Water criteria were identified in groundwater from GW101, GW103, MW01, MW03 and MW05. Off-site monitoring wells reported PFAS concentrations decreasing by orders of magnitude compared to on-site monitoring wells, however there are still exceedances of Health Drinking Water criteria in wells MW03 and MW05.

The calculated TDS of groundwater wells monitored ranged from 4,545 – 8,757 mg/L, with the exception of MW02 (TDS 1,868 mg/L). The ADWG (2011) state that palatability of drinking water is dependent on the TDS, stating that a TDS of > 1,200 mg/L is 'unacceptable'. As all wells reported a TDS above this threshold, it can be concluded that groundwater in proximity to the site and within the know plume extents is not suitable for human consumption, and therefore the drinking water guideline exceedances do not represent a risk due to an incomplete pathway.

Exceedances of the PFAS NEMP 2.0 2020 Recreational Water criteria (2.0 µg/L) were reported at on site wells GW101 and GW103 for sum of PFHxS and PFOS, and PFOS. As the River Torrents (Karrawirra Parri) does not allow for recreational use of the river, the guideline exceedances are not considered to impact human health recreational environmental values. Additionally off-site and downgradient monitoring wells did not report exceedances of the Recreational Water criteria, indicating that PFOS concentrations are likely to attenuate prior to reaching the River Torrens (Karrawirra Parri).

There are no complete linkages between the source and human health receptors for groundwater contamination due to the following conditions:

– The site and down hydraulic gradient areas are characterised by a high-density urban environment with little to no open ground or land uses that would likely extract groundwater.
– The are no registered groundwater wells for beneficial/extractive uses located downgradient of the site and south of the River Torrens (Karrawirra Parri).
– The observed decreases in PFAS concentrations in off-site monitoring wells, indicate that the plume likely attenuates via dilution and dispersion before it migrates to areas where beneficial uses of groundwater may occur (Parklands along the River Torrens (Karrawirra Parri)).
– The presence of a reticulated water supply negates the need for groundwater extraction for beneficial uses.

9.2.3 Assessment of potential risks to the aquatic environment

On-site wells MW01(1.5 µg/L), GW101 (22 µg/L) and GW103 (9.4 µg/L) reported exceedances of the PFAS NEMP 2.0 2020 Freshwater 95% guideline for PFOS (0.13 µg/L). Additionally GW101 and GW103 also exceeded the Freshwater 90% guidelines for PFOS (2.0 µg/L). No exceedances of the ecological guidelines were reported for PFOA for groundwater.

When comparing on-site monitoring wells to hydraulically downgradient off-site monitoring wells, PFOS concentrations are observed to be between two to three orders of magnitude lower in the off-site wells. This can be observed of a distance of approximately 40 m, indicating that there is a negative relationship between distance from the site and PFOS concentrations. As the nearest ecological receptor to the site is the River Torrens (Karrawirra Parri) located approximately 1.3 km to the north (down-hydraulic gradient) it is likely that the PFOS concentrations in groundwater will likely attenuate by the time groundwater discharges to the River. It should be noted that while no exceedances were reported in MW02, the well furthest downgradient from the site, the monitoring well still reported concentrations above the laboratory detection limit, indicating that PFAS impacts may be present further downgradient.

9.3 Stormwater and sediment

The preliminary CSM identified that the potential for PFAS contamination being transported off-site via stormwater discharge to the north and west of the site has not been investigated. The potentially complete SPR linkages identified for stormwater included:

– The aquatic ecosystems of the River Torrens (Karrawirra Parri) and Park 23 being exposed to PFAS following the migration and discharge stormwater to surface water.

The implications for the stormwater groundwater dataset collected during this investigation for this SPR linages is discussed herein.

9.3.1 Nature and extent of stormwater impacts

Stormwater locations were sampled during a rainfall event which provides an indication of how stormwater runoff can cause PFAS to migrate off-site. It is considered likely that when rainfall comes into contact with the hardstand on the site, the hardstand brick leaches PFAS into the surface water which then flows into drains and off-site.

Concentrations of Sum of PFHxS and PFOS ranged from 0.40 µg/L (SW05) to 5.2 µg/L (SW01) and concentrations of PFOA ranged from <0.01 µg/L (SW05) to 0.11 µg/L (SW16). All stormwater locations reported exceedances of the adopted assessment criteria for human health environmental values. SW01 was the only stormwater sample to exceed the ecological adopted assessment criteria. Additionally all stormwater locations exceeded the 95% Freshwater guideline (0.13 µg/L) for PFOS.

Of the five sediment samples available to sample, only SED01 (1.3 mg/kg) and SED06 (0.15 mg/kg) reported exceedances of the PFAS NEMP 2.0 2020 Ecological Indirect Exposure adopted assessment criteria (0.14 mg/kg). No exceedances of the Industrial / Commercial HIL D was reported in any sediment samples. There appears to be a correlation between sediment PFAS concentrations and elevated surface water PFAS concentrations. Both SW01 and SW06 reported the highest 'Sum of PFHxS and PFOS' concentrations (5.2 µg/L and 2.1 µg/L respectively).

Both samples (DAM_S and DAM_B) taken from the on-site dam exceeded the adopted assessment criteria for 95% freshwater ecological guidelines, human health drinking water guidelines and human health recreational water guidelines. Given the dam historically stored water for training purposes, the concrete walls are considered a likely ongoing source of PFAS impacts to retained water, and potentially groundwater given the depth (8 m bgl) .

9.3.2 Assessment of potential risks to human health

SW01 (PFOS and Sum of PFHxS and PFOS) and SW06 (Sum of PFHxS and PFOS)) reported exceedances of the PFAS NEMP 2.0 2020 Recreational Water guidelines. The closest water body (River Torrens (Karrawirra Parri)) does not receive direct runoff from the site and does not allow for the recreational use of the watercourse, meaning that the exceedances of recreational criteria do not reflect a risk to human health at this receptor. Park 23 creek and wetlands are part of the City's stormwater management network and are therefore not considered suitable for recreational use. PFAS impacted stormwater may ultimately be discharged to water bodies where recreational activities are undertaken (coastal lakes and marine environments), however these are several kilometres from the site and significant dilution is likely to have occurred before reaching these potential receptors.

Exceedances of the drinking water guidelines for site stormwater do not indicate a risk to human health via ingestion as it is highly unlikely that stormwater discharged from the site will interact with a drinking water supply.

The stormwater retention dam/pit located on-site is contained to prevent access and only discharges water to the storm system periodically, during significant rainfall events. A review of the infrastructure is currently underway to determine if it can be bypassed and decommissioned.

9.3.3 Assessment of potential risks to the aquatic environment

All stormwater samples reported exceedances of the PFAS NEMP 2.0 2020 95% Freshwater Species Protection guideline for PFOS (2.0 µg/L). SW01 was the only location which reported an exceedance of the PFAS NEMP 2.0 2020 90% Freshwater Species Protection for PFOS. There are no ecological receptors on site but, as discussed in Section 2.8, stormwater at the site is directly discharged to Wakefield Street to the north of the site. This flows into the stormwater system and into Park 23 where it is temporarily retained and then re-enters to storm system. Park 23 receives storm water from a large portion of the southwestern quadrant of Adelaide city and any concentrations of PFAS present may also represent a component of urban ambient background contamination. No off-site stormwater sampling was undertaken during the DSI.

While PFAS impacted stormwater is considered likely to be transporting contamination off-site during each rainfall event, the receiving water body (Park 23) is a component of the storm water system and is not considered a significant ecological receptor. Stormwater ultimately discharges to a fresh or marine environment (several kilometres downstream) where PFAS contamination can bioaccumulate in aquatic flora and fauna. It is very unlikely however that concentrations would exceed applicable guidelines at this point of discharge/exposure.

It should be noted that stormwater sampling was undertaken during a rainfall event, however water stored within the dam was not observed to be overflowing into the stormwater system. Because of this it is possible that a worse case scenario for PFAS impacted stormwater runoff was not captured during the sampling event.

10. Updated Conceptual Site Model

An updated tabular Conceptual Site Model (CSM) for the site, reviewed and updated as part of this DSI, is presented in Table 10.1 below.

Table 10.1 Conceptual Site Model

Potential Source	Receptor	Pathway	Pathway Present?	Comments
PFAS-impacted soil, sediment and concrete.	Firefighters and workers at the MFS site.	Incidental ingestion of contaminated soil or concrete dust.	No	PFAS concentrations detected in soil and sediment on-site following the DSI were below the applicable Tier 1 assessment criteria for the protection of human health. Given the commercial / industrial use of the site the ingestion of contaminated soil or concrete dust is not considered a complete pathway given the hardstand present at the site.
	Ecosystem at, and immediately surrounding, the site.	Direct or indirect exposure to contaminated soils or sediments.	No	PFAS concentrations detected in soil and sediment exceeded the adopted Tier 1 interim ecological criteria for indirect exposure. Soil is currently overlain by brick hardstand on the site and is therefore unlikely to come into contact with ecological receptors. Discharge of stormwater may carry small sediment loads through the stormwater system, however the volume of this is considered negligible in comparison to the volume of stormwater.
		Migration of soils/sediments to surface water bodies via storm water.	No	The River Torrens (Karrawirra Parri) and the western Adelaide Parklands (including the Park 23 creek) are located approximately 1.3 km to the north (down-hydraulic gradient) and west of the site, respectively. The reported PFAS concentrations in soil and sediment exceeded the adopted ecological criteria and the soil contamination resulted in groundwater impact. Similarly to sediments, given the soil is overlain by hardstand it is highly unlikely for contaminated soils to enter a surface water body.
	Groundwater beneath the site.	Migration through soil.	Yes	PFAS leaching from impacted soil has resulted in groundwater contamination. As PFAS permeates through the soil over time it has migrated to intersect with the water table. Groundwater has interacted with the contaminated soil and resulted in groundwater contamination which has migrated off-site.
PFAS-impacted surface/storm water (from drains & storage dam).	Firefighters and workers at the MFS site.	Direct dermal contact with contaminated stormwater.	No	Given the industrial / commercial use of the site, it is considered highly unlikely that human ingestion of the contaminated stormwater will occur.
		Incidental ingestion of contaminated stormwater.	No	

Potential Source	Receptor	Pathway	Pathway Present?	Comments
	Ecosystem at, and immediately surrounding, the site.	Stormwater runoff from site discharging to freshwater environments.	No	Stormwater testing has identified PFAS concentrations exceeding ecological criteria however, there are no ecological receptors at, or immediately surrounding the site. The River Torrens (Karrawirra Parri) and the western Adelaide Parklands (including the Park 23 creek) are located approximately 1.3 km to the north (down-hydraulic gradient) and west of the site, respectively. As outlined in Section 0, stormwater from the site is discharged via stormwater drains to Park 23 where it is retained. Stormwater from Park23 then re-enters the underground stormwater system and likely discharged to a fresh or marine ecosystem several kilometres away. The distance to these receptors and dilution occurring during transport via stormwater drains would likely reduce concentrations to a level that does not represent a risk prior to discharge/exposure to a receptor.
	Recreation use of surface water bodies.	Incidental ingestion of surface water.	No	The closest water body is the River Torrens (Karrawirra Parri), which is not used for swimming. Water activities (boating etc.) undertaken on the River Torrens (Karrawirra Parri) are unlikely to result in consumption of impacted water at volumes that would pose a health risk from PFAS.
	Groundwater beneath the site.	Surface/storm water infiltration.	No	While storm water is collected as surface runoff and transferred into the storage dam, some water may also infiltrate the ground and reach the groundwater. However, given the depth to groundwater this is considered unlikely.
PFAS-impacted groundwater.	People using groundwater for: domestic and drinking purposes.	Consumption of contaminated groundwater.	No	As the TDS of the groundwater exceeds the highest TDS threshold in the ADWG the consumption of groundwater in the surrounding area can be ruled out. Additionally the Adelaide CBD has reticulated water supply for drinking water for buildings and does not rely on groundwater for human consumption.
	People using groundwater for: irrigation of vegetable gardens and / or fruit trees with which they grow produce for consumption.	Consumption of fruit and vegetables irrigated by contaminated groundwater.	No	Although some domestic / irrigation bores were located within a 2 km radius of the site, there are no extraction bores located down hydraulic gradient and re it is considered unlikely that groundwater would currently be used for the irrigation of substantial areas of fruit and vegetables within the Adelaide CBD, particularly due to presence of reticulated water supply.
	People using groundwater for recreational purposes such as filling of swimming pools.	Incidental ingestion of contaminated groundwater.	No	Groundwater use for recreational purposes such as filling of swimming pools is considered unlikely. The closest water body is the River Torrens (Karrawirra Parri), which is not used for recreational swimming. Water activities (boating etc.) undertaken on the River Torrens (Karrawirra Parri) are unlikely to result in consumption of impacted water at volumes that would pose a health risk from PFAS.

Potential Source	Receptor	Pathway	Pathway Present?	Comments
	Down gradient off-site maintenance workers that contact PFAS contaminated groundwater.	Direct dermal contact or incidental ingestion of contaminated groundwater.	No	Whilst it is possible that off-site maintenance workers could incidentally ingest contaminated groundwater, it is unlikely that they will ingest quantities detrimental to their health. The depth to groundwater (approximately 12 mbgl) is also likely beyond the reach of most construction activities. Additionally the dissipating concentrations of PFAS in wells further away from the site somewhat mitigate this pathway.
	Ecosystem of the River Torrens (Karrawirra Parri) and the Park 23 Creek (western Adelaide Parklands).	Migration via groundwater and discharge to surface water bodies.	Maybe	The River Torrens (Karrawirra Parri) is located approximately 1.3 km to the north (down-hydraulic gradient). The reported PFAS concentrations in groundwater beneath the site exceeded the adopted ecological criteria at two on site locations. No off-site wells reported concentrations exceeding the ecological criteria, and given the distance to a surface water receptor, the noted decrease in concentrations downgradient from the site and the removal of the primary source (AFFF use) it is considered unlikely that PFAS impacts would reach the receptor in concentrations that present an ecological risk. It is also likely that ambient urban concentrations of PFAs are present in a highly disturbed system such as the River Torrens (Karrawirra Parri), although this has not been confirmed.

11. Conclusions

The DSI undertaken set out to achieve the following objectives:

– To determine the nature and extent of PFAS site contamination, both on- and off-site.
– To assess the potential risks to human health and the environment associated with on-site PFAS contamination, in the context of continued industrial use.
– To assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.

To complete the objectives, GHD undertook the following:

– Drilling and soil sampling of 15 on-site soil bores.
– Installation of one on-site groundwater monitoring well and five off-site groundwater monitoring wells.
– One GME comprising seven on-site wells and five off-site wells.
– Stormwater sampling at seven on-site locations.
– Sediment sampling at five on-site locations.

The following conclusions were made following the DSI:

– There are PFAS impacts identified in soil, groundwater, stormwater and sediment on-site which can be attributed to the historical use of PFAS containing AFFF.
– No exceedances of human health guidelines have been identified in soil at the site for a commercial /industrial setting, and furthermore, impacted soils are overlain by hardstand which prevents direct contact.
– Soil leachability analysis suggests the shallow soils beneath the site are potentially an ongoing source of PFAS impacts to groundwater although the amount of infiltration through surface materials (hardstand) and potential flux to groundwater is unknown.
– On-site groundwater wells reported exceedances of the drinking water, recreational and ecological adopted assessment criteria.
– PFAS impacted groundwater has migrated off-site, generally in the inferred groundwater flow direction (north-west) and exceeds the applied drinking water guidelines at monitoring well locations MW03 (approximately 70 m down-gradient-NW) and MW05 (approximately 50 m cross-gradient – West). The concentrations are noted to be three to four orders of magnitude lower than those on-site and are therefore not expected to extend a significant distance in concentrations above the criteria.
– PFAS impacted groundwater is not expected to impact human health via drinking water given the groundwater is not suitable for consumption (measured TDS > 1200 mg/L), the presence of a reticulated water supply and the absence of groundwater bores for extraction purposes down-gradient from the site.
– PFAS impacted groundwater is not expected to impact human health via recreational use given the concentrations in off-site monitoring wells do not exceed the guideline, and furthermore, the nearest surface water body (River Torrens (Karrawirra Parri) is located approximately 1300 meters down-gradient from the site and does not allow recreational activities.
– PFAS impacted groundwater beneath the site exceed the applied ecological criteria for freshwater, however groundwater sampled from off-site well locations are below the criteria and decreasing significantly with increasing distance from the site. It is also likely that ambient concentrations of PFAS are present within highly modified urban waterways such as the River Torrens (Karrawirra Parri), however this has not been established.
– Stormwater sampling across the site identified exceedances of drinking water, recreational and ecological adopted assessment criteria however there are no direct discharges to recreational waterbodies, interaction with the drinking water supplies or nearby significant ecological receptors. Although the exceedances exist in stormwater sampled at the site, significant dilution would occur during transport to a human health or ecological receptor due to the distance (several kilometres) and other stormwater inputs. It is also likely that ambient PFAS concentrations exist in an urban stormwater system however this has not been determined.

– Sediment samples taken did not exceed the adopted assessment criteria and therefore is not expected to impact the environmental values at the site or surrounding area.

The following data gaps remain following the completion of the DSI:

– Potential PFAS impacts in nearby surface water bodies (site sourced or ambient) are not currently known and the potential presence of ambient background contamination.

12. References

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Figures

Figure 1 *Site Location Plan*

Figure 2 *Soil Investigation Locations*

Figure 3 *Soil Exceedances of Adopted Assessment Criteria*

Figure 4 *Groundwater Monitoring Well Locations*

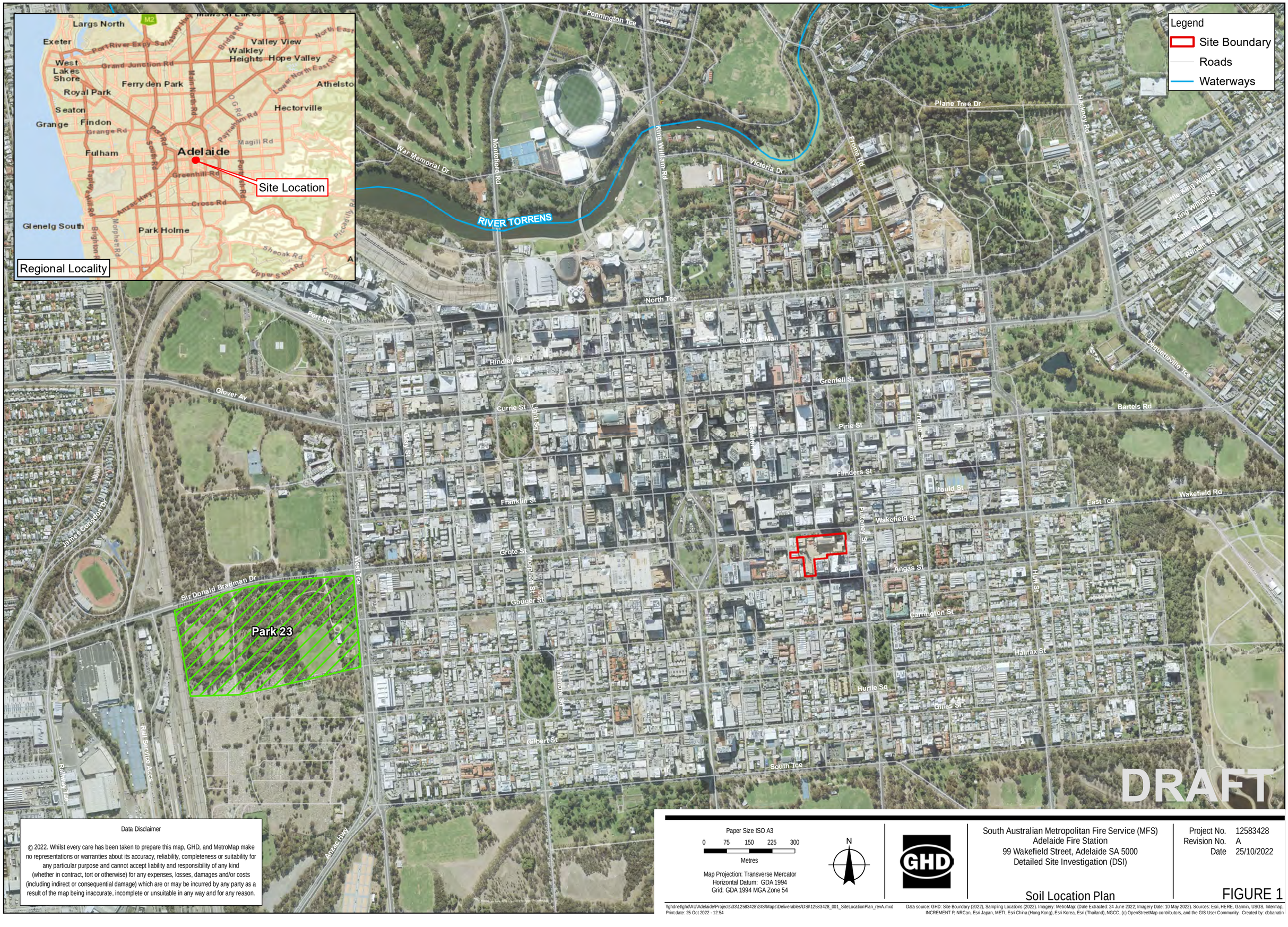
Figure 5 *Groundwater Contour Map*

Figure 6 *Groundwater Exceedances of Adopted Assessment Criteria*

Figure 7 *Groundwater PFOS, PHFxS and PFOA concentration map*

Figure 8 *Stormwater and sediment sampling locations*

Figure 9 *Stormwater and sediment Exceedances of Adopted Assessment Criteria*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Waterways
Regional Locality
Site Location
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West Lakes Shore
Royal Park
Seaton
Grange
Findon
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Ferryden Park
Valley View
Walkley Heights
Hope Valley
Hectorville
Athelsto
Adelaide
Glenelg South
Park Holme
Pennington Tce
War Memorial Dr
RIVER TORRENS
Montefiore Rd
King William Rd
Victoria Dr
Frome Rd
Plane Tree Dr
Hackney Rd
North Tce
Port Rd
Hindley St
Rundle Mall
Grenfell St
Currie St
Light Sq
Pirie St
Flinders St
Ifould St
Wakefield Rd
East Tce
Franklin St
Wakefield St
Grote St
Morphett St
Gouger St
Angas St
Carrington St
Halifax St
Hurtle Sq
Gilles St
Gilbert St
South Tce
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West Tce
Rail Service Accs
Railway Tce
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Grid: GDA 1994 MGA Zone 54
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99 Wakefield Street, Adelaide SA 5000
Detailed Site Investigation (DSI)
Soil Location Plan
Project No. 12583428
Revision No. A
Date 25/10/2022
FIGURE 1
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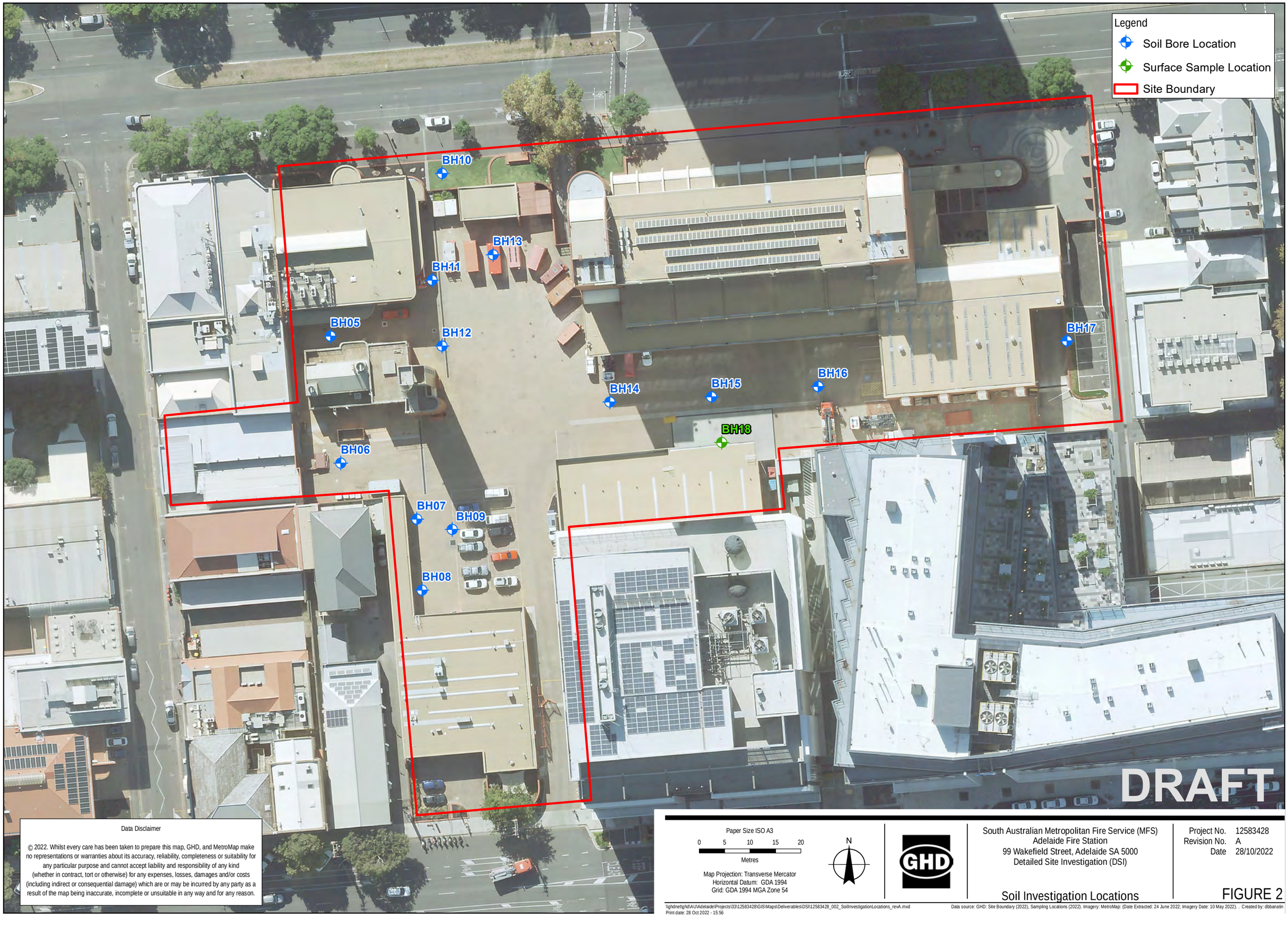

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Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Detailed Site Investigation (DSI)

Soil Investigation Locations

Project No. 12583428
Revision No. A
Date 28/10/2022

FIGURE 2

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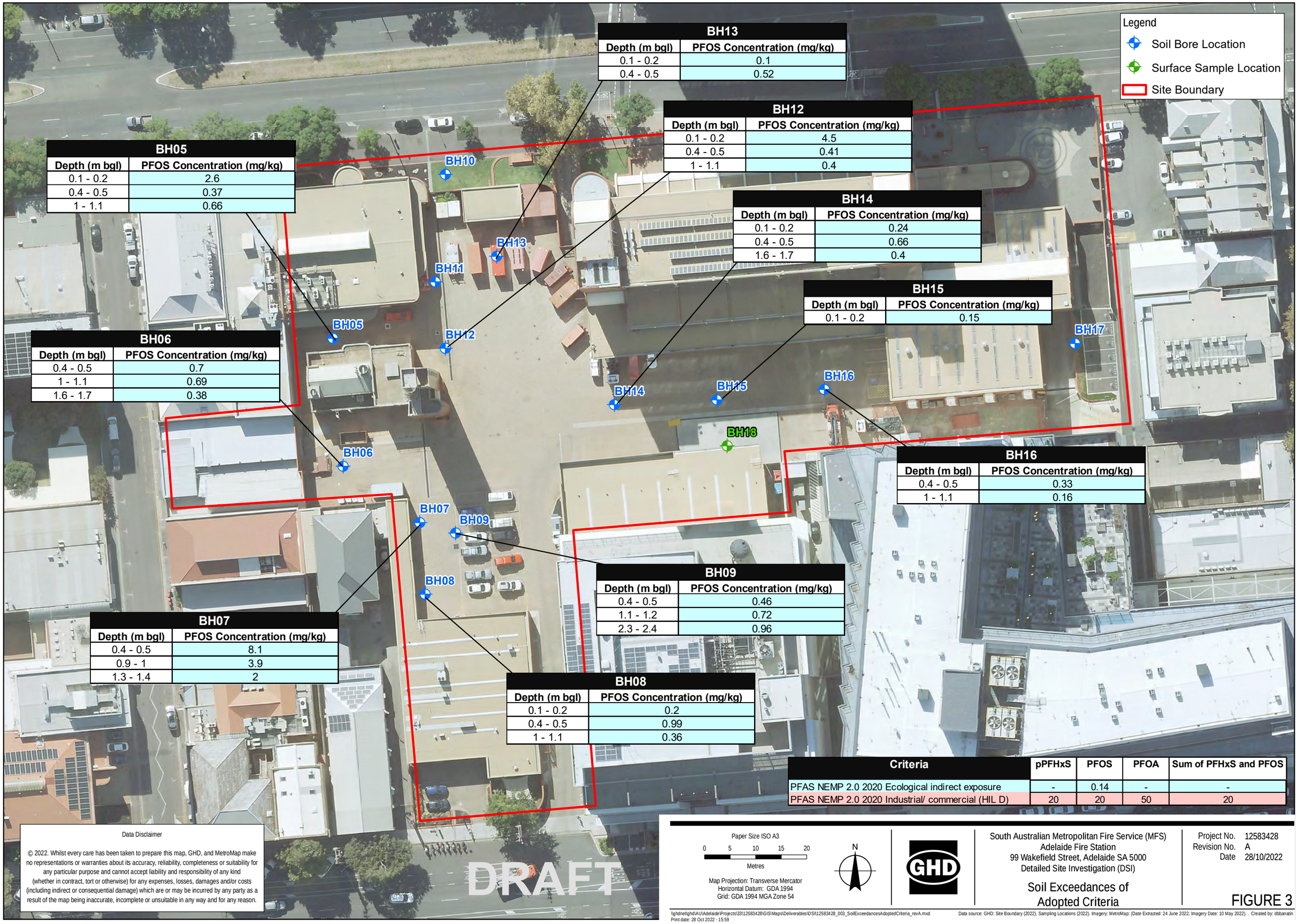

BH13	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.1 - 0.2	0.1
0.4 - 0.5	0.52

BH12	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.1 - 0.2	4.5
0.4 - 0.5	0.41
1 - 1.1	0.4

BH05	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.1 - 0.2	2.6
0.4 - 0.5	0.37
1 - 1.1	0.66

BH14	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.1 - 0.2	0.24
0.4 - 0.5	0.66
1.6 - 1.7	0.4

BH15	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.1 - 0.2	0.15

BH06	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.4 - 0.5	0.7
1 - 1.1	0.69
1.6 - 1.7	0.38

BH16	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.4 - 0.5	0.33
1 - 1.1	0.16

BH07	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.4 - 0.5	8.1
0.9 - 1	3.9
1.3 - 1.4	2

BH09	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.4 - 0.5	0.46
1.1 - 1.2	0.72
2.3 - 2.4	0.96

BH08	
Depth (m bgl)	PFOS Concentration (mg/kg)
0.1 - 0.2	0.2
0.4 - 0.5	0.99
1 - 1.1	0.36

Criteria	pPFHxS	PFOS	PFOA	Sum of PFHxS and PFOS
PFAS NEMP 2.0 2020 Ecological indirect exposure	-	0.14	-	-
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)	20	20	50	20

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Map Projection: Transverse Mercator
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Soil Exceedances of Adopted Criteria

Project No. 12583428
Revision No. A
Date 28/10/2022

FIGURE 3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service (MFS)
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Detailed Site Investigation (DSI)

Groundwater Monitoring Well Locations

Project No. 12583428
Revision No. A
Date 28/10/2022

FIGURE 4

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
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Detailed Site Investigation (DSI)

Groundwater Contour Map

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FIGURE 5

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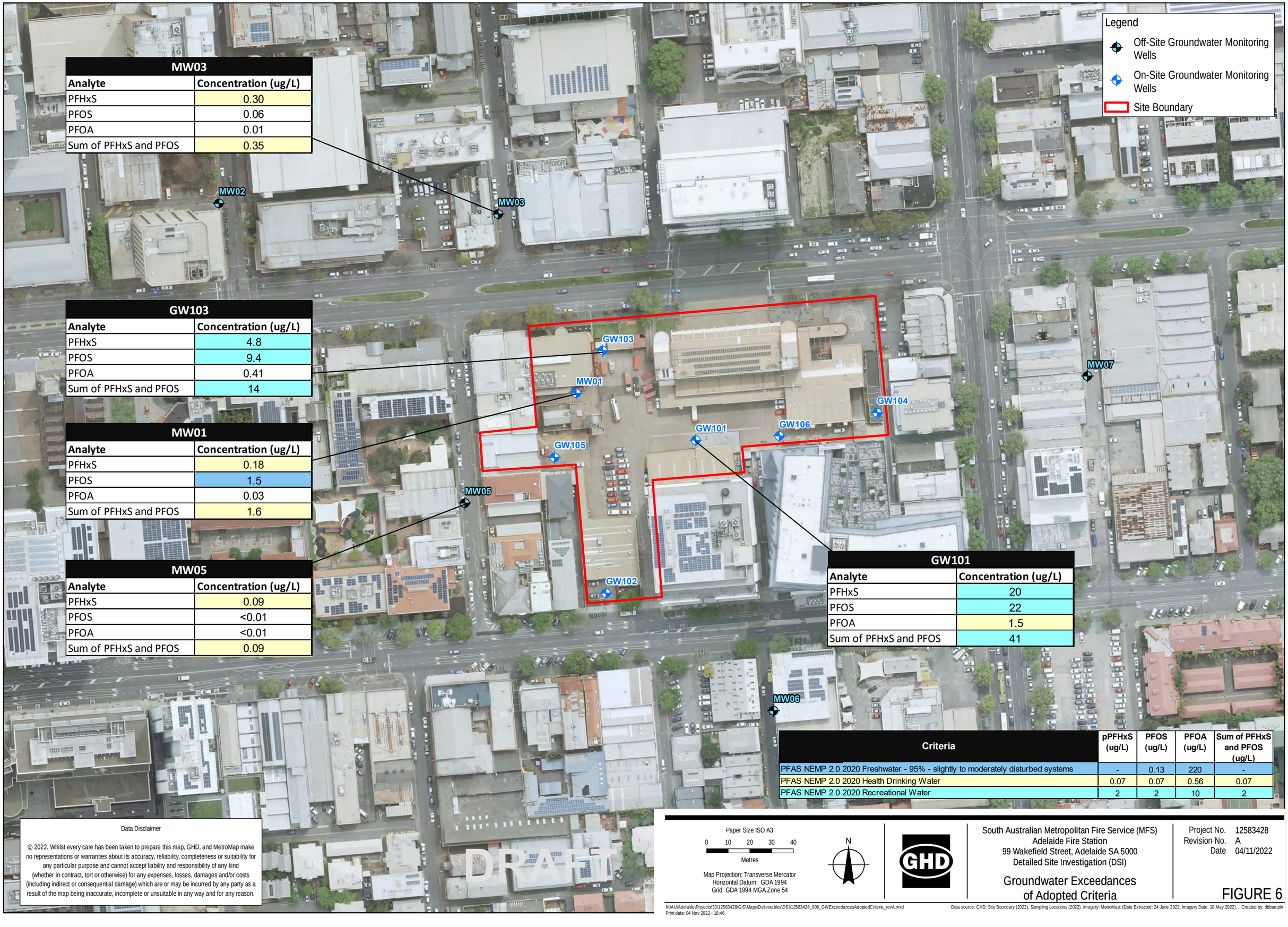

MW03	
Analyte	**Concentration (ug/L)**
PFHxS	0.30
PFOS	0.06
PFOA	0.01
Sum of PFHxS and PFOS	0.35

GW103	
Analyte	**Concentration (ug/L)**
PFHxS	4.8
PFOS	9.4
PFOA	0.41
Sum of PFHxS and PFOS	14

MW01	
Analyte	**Concentration (ug/L)**
PFHxS	0.18
PFOS	1.5
PFOA	0.03
Sum of PFHxS and PFOS	1.6

MW05	
Analyte	**Concentration (ug/L)**
PFHxS	0.09
PFOS	<0.01
PFOA	<0.01
Sum of PFHxS and PFOS	0.09

GW101	
Analyte	**Concentration (ug/L)**
PFHxS	20
PFOS	22
PFOA	1.5
Sum of PFHxS and PFOS	41

Criteria	pPFHxS (ug/L)	PFOS (ug/L)	PFOA (ug/L)	Sum of PFHxS and PFOS (ug/L)
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems	-	0.13	220	-
PFAS NEMP 2.0 2020 Health Drinking Water	0.07	0.07	0.56	0.07
PFAS NEMP 2.0 2020 Recreational Water	2	2	10	2

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service (MFS)
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Detailed Site Investigation (DSI)

Groundwater Exceedances of Adopted Criteria

Project No. 12583428
Revision No. A
Date 04/11/2022

FIGURE 6

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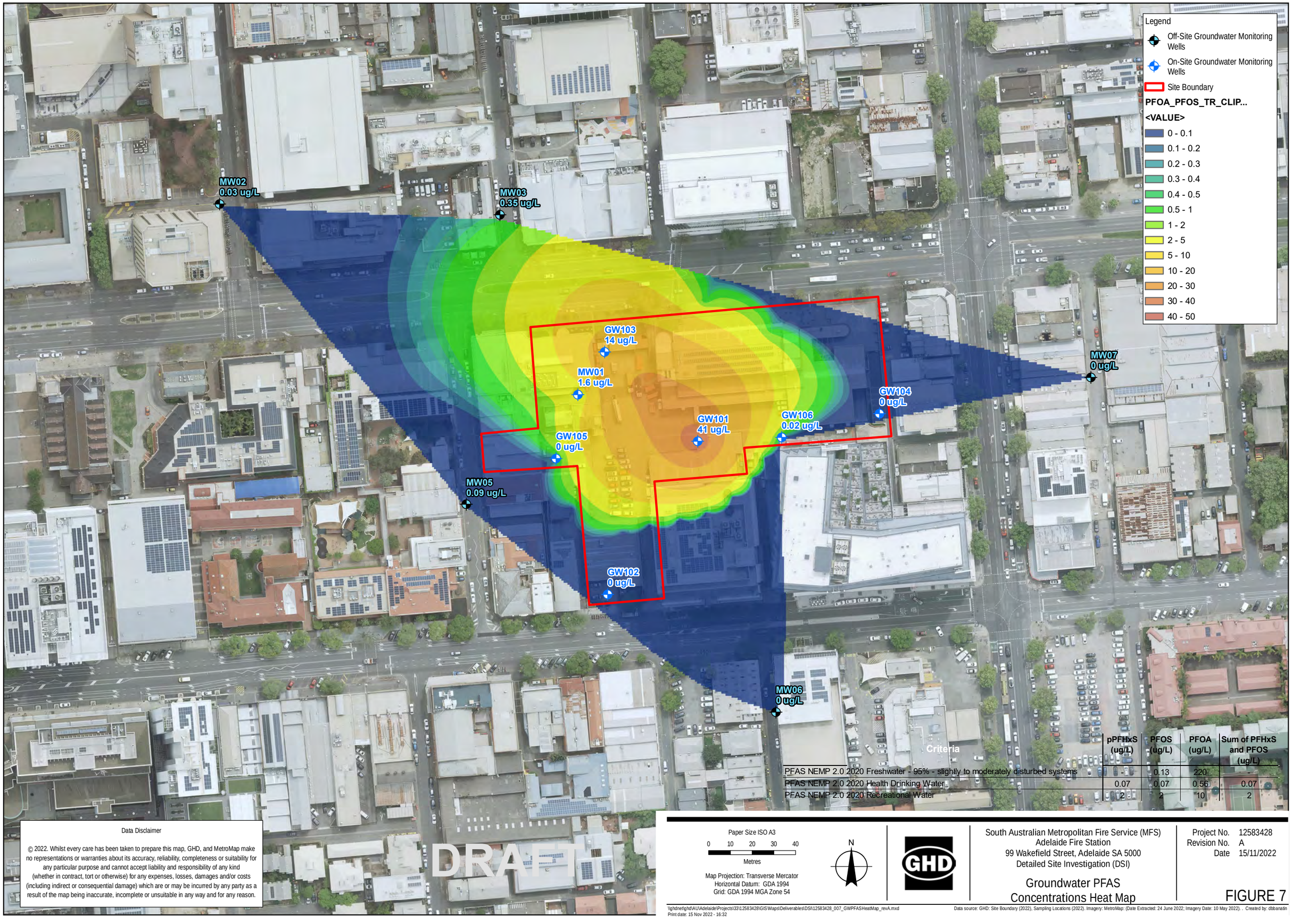

Criteria	pPFHxS (ug/L)	PFOS (ug/L)	PFOA (ug/L)	Sum of PFHxS and PFOS (ug/L)
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems	-	0.13	220	-
PFAS NEMP 2.0 2020 Health Drinking Water	0.07	0.07	0.56	0.07
PFAS NEMP 2.0 2020 Recreational Water	2	2	10	2

Paper Size ISO A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service (MFS)
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Detailed Site Investigation (DSI)

Groundwater PFAS Concentrations Heat Map

Project No. 12583428
Revision No. A
Date 15/11/2022

FIGURE 7

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Print date: 15 Nov 2022 - 16:32

Data source: GHD: Site Boundary (2022), Sampling Locations (2022). Imagery: MetroMap: (Date Extracted: 24 June 2022; Imagery Date: 10 May 2022). . Created by: dbbanatin

Data Disclaimer

Paper Size ISO A3

0 5 10 15 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

GHD

South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Detailed Site Investigation (DSI)

Stormwater & Sediment Sampling Locations

Project No. 12583428
Revision No. A
Date 28/10/2022

FIGURE 8

\\ghdnet\ghd\AU\Adelaide\Projects\33\12583428\GIS\Maps\Deliverables\DSI\12583428_008_SurfaceWaterSediment_revA.mxd
Print date: 28 Oct 2022 - 15:51

Data source: GHD: Site Boundary (2022), Sampling Locations (2022). Imagery: MetroMap: (Date Extracted: 24 June 2022; Imagery Date: 10 May 2022). . Created by: dbbanatin

SW11	
Analyte	Concentration (mg/L)
PFHxS	0.24
PFOS	1.4
PFOA	0.03
Sum of PFHxS and PFOS	1.6

SW05	
Analyte	Concentration (mg/L)
PFHxS	0.09
PFOS	0.31
PFOA	<0.01
Sum of PFHxS and PFOS	0.40

SW06	
Analyte	Concentration (mg/L)
PFHxS	0.35
PFOS	1.7
PFOA	0.05
Sum of PFHxS and PFOS	2.1

SW16	
Analyte	Concentration (mg/L)
PFHxS	1.3
PFOS	0.15
PFOA	0.11
Sum of PFHxS and PFOS	1.5

SW05 / SED05

SW11 / SED11

SW16

SW14

SW06 / SED06

SW03

SW01 / SED01

SW03	
Analyte	Concentration (mg/L)
PFHxS	0.09
PFOS	1.8
PFOA	0.01
Sum of PFHxS and PFOS	1.9

SW01	
Analyte	Concentration (mg/L)
PFHxS	0.20
PFOS	5.0
PFOA	0.04
Sum of PFHxS and PFOS	5.2

SW14	
Analyte	Concentration (mg/L)
PFHxS	0.13
PFOS	0.53
PFOA	0.01
Sum of PFHxS and PFOS	0.66

Legend

- Stormwater and Sediment Sampling Location
- Stormwater Sampling Location
- Site Boundary

Criteria	pPFHxS (mg/L)	PFOS (mg/L)	PFOA (mg/L)	Sum of PFHxS and PFOS (mg/L)
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed	-	0.13	220	-
PFAS NEMP 2.0 2020 Health Drinking Water	0.07	0.07	0.56	0.07
PFAS NEMP 2.0 2020 Recreational Water	2	2	10	2
PFAS NEMP 2.0 2020 Ecological indirect exposure (Sediment only)	-	0.14	-	-

Paper Size ISO A3

0 5 10 15 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

N

GHD

South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Detailed Site Investigation (DSI)

Stormwater Exceedances of Adopted Criteria

Project No. 12583428
Revision No. A
Date 28/10/2022

FIGURE 9

\\ghdnet\ghd\AU\Adelaide\Projects\33\12583428\GIS\Maps\Deliverables\DSI\12583428_009_SWExceedancesAdoptedCriteria_revA.mxd
Print date: 28 Oct 2022 - 15:57

Data source: GHD: Site Boundary (2022), Sampling Locations (2022). Imagery: MetroMap: (Date Extracted: 24 June 2022; Imagery Date: 10 May 2022). . Created by: dbbanatin

Tabulated Analytical Results

Tabulated Analytical Results Table 1	*Soil Analytical Results*
Tabulated Analytical Results Table 2	*Leachate Analytical Results*
Tabulated Analytical Results Table 3	*Groundwater Analytical Results*
Tabulated Analytical Results Table 4	*Surface Water Analytical Results*
Tabulated Analytical Results Table 5	*Sediment Analytical Results*
Tabulated Analytical Results Table 6	*Dam Analytical Results*

					Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids		PFAS - Perfluoroalkyl Carboxylic Acids	PFAS - Fluorotelomer Sulfonic Acids		PFAS - Sums		
					Moisture (%)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)
					%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
PFAS NEMP 2.0 2020 Ecological indirect exposure							0.14						
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)						20	20	50			20		
Location Code	**Field ID**	**Depth**	**Date**	**Lab Report Number**									
BH05	BH05_0.1-0.2	0.1 - 0.2	4/08/2022	33011	4.3	0.35	2.6	0.049	0.013	0.001	3	2.7	3.1
	BH05_0.4-0.5	0.4 - 0.5	4/08/2022	33011	15	0.038	0.37	0.0030	0.0004	0.0006	0.41	0.38	0.42
	BH05_1.0-1.1	1 - 1.1	4/08/2022	33011	29	0.018	0.66	0.0031	0.0004	0.0005	0.68	0.66	0.68
	BH05_1.5-1.6	1.5 - 1.6	4/08/2022	33011-A	27	0.014	0.061	0.0010	0.0003	<0.0002	0.074	0.062	0.076
	BH05_2.4-2.5	2.4 - 2.5	4/08/2022	33011-A	29	0.025	0.016	0.0011	0.0002	<0.0002	0.04	0.017	0.042
BH06	BH06_0.1-0.2	0.1 - 0.2	4/08/2022	33011	11	0.0035	0.093	0.0004	0.0002	0.001	0.097	0.094	0.099
	BH06_0.4-0.5	0.4 - 0.5	4/08/2022	33011	16	0.019	0.7	0.0013	0.0008	<0.0002	0.72	0.71	0.73
	BH06_1.0-1.1	1 - 1.1	4/08/2022	33011-A	28	0.026	0.69	0.0033	0.0031	<0.0002	0.72	0.7	0.73
	BH06_1.6-1.7	1.6 - 1.7	4/08/2022	33011-A	21	0.032	0.38	0.0065	0.0039	<0.0002	0.42	0.39	0.43
	BH06_2.4-2.5	2.4 - 2.5	4/08/2022	33011-B	26	0.02	0.021	0.0017	0.0069	<0.0002	0.041	0.023	0.049
BH07	BH07_0.4-0.5	0.4 - 0.5	5/08/2022	33011	10	0.051	8.1	0.0053	0.061	<0.0002	8.1	8.1	8.2
	BH07_0.9-1.0	0.9 - 1	5/08/2022	33011	12	0.21	3.9	0.018	0.042	<0.0002	4.1	3.9	4.1
	BH07_1.3-1.4	1.3 - 1.4	5/08/2022	33011-A	16	0.36	2	0.041	0.011	<0.0002	2.3	2	2.4
BH08	BH08_0.1-0.2	0.1 - 0.2	5/08/2022	33011	6.7	0.0049	0.2	0.0005	0.0007	0.0023	0.2	0.2	0.21
	BH08_0.4-0.5	0.4 - 0.5	5/08/2022	33011	20	0.027	0.99	0.0021	0.0007	0.0004	1	0.99	1
	BH08_1.0-1.1	1 - 1.1	5/08/2022	33011-A	26	0.17	0.36	0.053	0.0044	<0.0002	0.53	0.42	0.59
	BH08_1.6-1.7	1.6 - 1.7	5/08/2022	33011-A	22	0.076	0.0068	0.02	0.0011	<0.0002	0.083	0.027	0.1
	BH08_2.4-2.5	2.4 - 2.5	5/08/2022	33011-B	21	0.085	0.044	0.0064	0.0039	<0.0002	0.13	0.05	0.14
BH09	BH09_0.1-0.2	0.1 - 0.2	5/08/2022	33011	9.1	0.0015	0.029	0.0002	0.0004	0.002	0.031	0.029	0.033
	BH09_0.4-0.5	0.4 - 0.5	5/08/2022	33011	20	0.012	0.46	0.0014	0.0032	0.0074	0.47	0.46	0.48
	BH09_1.1-1.2	1.1 - 1.2	5/08/2022	33011-A	23	0.011	0.72	0.0014	0.016	0.0004	0.73	0.72	0.75
	BH09_2.3-2.4	2.3 - 2.4	5/08/2022	33011-B	20	0.029	0.96	0.0034	0.042	<0.0002	0.99	0.97	1
BH09B	BH09B_3.4-3.5	3.4 - 3.5	5/08/2022	33011-B	21	0.0066	0.0066	0.0005	0.0004	<0.0002	0.013	0.0071	0.014
BH10	BH10_0.1-0.2	0.1 - 0.2	11/08/2022	33104	24	0.0018	0.039	0.0002	<0.0001	<0.0002	0.041	0.039	0.041
	BH10_0.4-0.5	0.4 - 0.5	11/08/2022	33104	12	0.0002	0.019	<0.0001	<0.0001	<0.0002	0.019	0.019	0.019
	BH10_0.9-1.0	0.9 - 1	11/08/2022	33104	18	0.0006	0.051	<0.0001	<0.0001	<0.0002	0.052	0.051	0.052
	BH10_1.3-1.4	1.3 - 1.4	11/08/2022	33104-A	22	0.0007	0.11	<0.0001	<0.0001	<0.0002	0.11	0.11	0.11
BH11	BH11_0.1-0.2	0.1 - 0.2	4/08/2022	33011	6.5	0.001	0.0075	0.0002	<0.0001	0.001	0.0085	0.0078	0.0097
	BH11_0.4-0.5	0.4 - 0.5	4/08/2022	33011	7.8	0.0016	0.052	0.0003	0.0002	0.0058	0.054	0.053	0.06
BH12	BH12_0.1-0.2	0.1 - 0.2	4/08/2022	33011	8.6	0.0059	4.5	0.0020	0.032	0.014	4.5	4.5	4.5
	BH12_0.4-0.5	0.4 - 0.5	4/08/2022	33011	10	0.0041	0.41	0.0005	0.0020	0.001	0.42	0.41	0.42
	BH12_1.0-1.1	1 - 1.1	4/08/2022	33011-A	15	0.0027	0.4	0.0009	0.0029	<0.0002	0.4	0.4	0.4
	BH12_1.5-1.6	1.5 - 1.6	4/08/2022	33011-A	20	0.0032	0.053	0.0005	0.0011	<0.0002	0.056	0.053	0.058
	BH12_2.4-2.5	2.4 - 2.5	4/08/2022	33011-B	24	0.0037	0.057	0.0006	0.0014	<0.0002	0.061	0.058	0.063
BH13	BH13_0.1-0.2	0.1 - 0.2	4/08/2022	33011	7.2	0.0016	0.1	0.0001	<0.0001	0.0004	0.1	0.1	0.1
	BH13_0.4-0.5	0.4 - 0.5	4/08/2022	33011	11	0.0099	0.52	0.0006	0.0002	<0.0002	0.53	0.52	0.53
	BH13_0.9-1.0	0.9 - 1	4/08/2022	33011-A	13	0.027	0.013	0.0015	<0.0001	<0.0002	0.039	0.014	0.041
	BH13_1.4-1.5	1.4 - 1.5	4/08/2022	33011-A	27	0.032	0.05	0.0075	<0.0001	<0.0002	0.082	0.058	0.09
	BH13_2.3-2.4	2.3 - 2.4	4/08/2022	33011-B	21	0.035	0.067	0.0017	0.0001	<0.0002	0.1	0.068	0.1
BH14	BH14_0.1-0.2	0.1 - 0.2	5/08/2022	33011	6.0	0.0055	0.24	0.0004	0.0001	0.0003	0.25	0.24	0.25
	BH14_0.4-0.5	0.4 - 0.5	5/08/2022	33011	7.0	0.0089	0.66	0.0008	0.0015	<0.0002	0.67	0.67	0.68
	BH14_1.0-1.1	1 - 1.1	5/08/2022	33011-A	22	0.011	0.068	0.0004	<0.0001	<0.0002	0.079	0.068	0.079
	BH14_1.6-1.7	1.6 - 1.7	5/08/2022	33011-A	28	0.038	0.4	0.0040	<0.0001	<0.0002	0.44	0.41	0.44
	BH14_2.4-2.5	2.4 - 2.5	5/08/2022	33011-B	19	0.0082	0.013	0.0007	0.0002	<0.0002	0.021	0.014	0.022
BH15	BH15_0.1-0.2	0.1 - 0.2	5/08/2022	33011	3.7	0.0080	0.15	0.0006	0.0002	<0.0002	0.16	0.15	0.16
	BH15_0.4-0.5	0.4 - 0.5	5/08/2022	33011	3.6	0.017	0.012	0.0027	<0.0001	<0.0002	0.029	0.015	0.031
	BH15_0.9-1.0	0.9 - 1	5/08/2022	33011-A	24	0.021	0.0021	0.0011	<0.0001	<0.0002	0.023	0.0032	0.024
BH16	BH16_0.1-0.2	0.1 - 0.2	5/08/2022	33011	9.4	0.0087	0.13	0.0006	0.0003	0.0004	0.14	0.13	0.14
	BH16_0.4-0.5	0.4 - 0.5	5/08/2022	33011	17	0.0053	0.33	0.0014	0.0008	0.0033	0.33	0.33	0.34
	BH16_1.0-1.1	1 - 1.1	5/08/2022	33011-A	21	0.0038	0.16	0.0023	0.0007	0.0031	0.16	0.16	0.17
	BH16_1.6-1.7	1.6 - 1.7	5/08/2022	33011-A	23	0.0008	0.0095	0.0003	<0.0001	<0.0002	0.01	0.0097	0.01
BH17	BH17_0.1-0.2	0.1 - 0.2	11/08/2022	33104	17	0.0001	0.0040	<0.0001	<0.0001	<0.0002	0.0041	0.0040	0.0041
	BH17_0.4-0.5	0.4 - 0.5	11/08/2022	33104	13	0.0004	0.012	0.0002	<0.0001	<0.0002	0.013	0.012	0.013
BH18	BH18_0.2-0.3	0.2 - 0.3	5/08/2022	33011	7.1	0.022	0.016	0.0019	0.0020	<0.002	0.038	0.018	0.042
	BH18_0.5-0.6	0.5 - 0.6	5/08/2022	33011	20	0.0013	0.0001	0.0001	<0.0001	<0.0002	0.0015	0.0003	0.0016

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)

				PFAS - Perfluoroalkyl		PFAS -	PFAS - Fluorotelomer			PFAS - Sums	
				Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.0002	0.0002	0.0002	0.0004	0.0004	0.0002	0.0002	0.0002
PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems					2	632					
PFAS NEMP 2.0 2020 Health Drinking Water				0.07	0.07	0.56			0.07		
PFAS NEMP 2.0 2020 Recreational Water				2	2	10			2		
Location Code	**Field ID**	**Depth**	**Date**	**Lab Report Number**							
BH07	BH07_0.4-0.5	0.4 - 0.5	5/08/2022	33011-A	1.4	190	0.13	2.7	<0.02	190	190	200
BH07					1.9	320	0.17	3.5	-	320	320	320
BH07	BH07_0.9-1.0	0.9 - 1	5/08/2022	33011-A	12	98	0.75	2.0	<0.02	110	98	110
BH07					13	130	0.79	2.3	-	140	130	150

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

					PFAS - Sums			PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carb					
					Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluoropentanoic acid (PFPeA)	Perfluorohexanoic acid (PFHxA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorononanoic acid (PFNA)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.0002	0.0002	0.0002	0.0004	0.001	0.0002	0.001	0.0002	0.002	0.002	0.002	0.0004	0.0004	0.0002	0.001
PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems												2						632	
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems												0.13						220	
PFAS NEMP 2.0 2020 Health Drinking Water					0.07					0.07		0.07						0.56	
PFAS NEMP 2.0 2020 Recreational Water					2					2		2						10	
Location Code	**Date**	**Field ID**	**Lab Report Number**	**Depth**															
GW101	29/09/2022	GW101	33831		41	23	62	1.7	2.1	20	1.4	22	<0.02	0.99	1.8	9.2	0.79	1.5	0.19
GW102	29/09/2022	GW102	33831		<0.01	<0.01	<0.01	-	-	<0.01	-	<0.01	-	-	-	-	-	<0.01	-
GW103	5/10/2022	GW103	307356		14	9.9	15	-	-	4.8	-	9.4	-	-	-	-	-	0.41	-
GW104	29/09/2022	GW104	33831		<0.01	<0.01	<0.01	-	-	<0.01	-	<0.01	-	-	-	-	-	<0.01	-
GW105	5/10/2022	GW105	307356		<0.01	<0.01	<0.01	-	-	<0.01	-	<0.01	-	-	-	-	-	<0.01	-
GW106	29/09/2022	GW106	33831		0.02	0.02	0.02	-	-	<0.01	-	0.02	-	-	-	-	-	<0.01	-
MW01	5/10/2022	MW01	307356		1.6	1.5	1.8	-	-	0.18	-	1.5	-	-	-	-	-	0.03	-
MW02	5/10/2022	MW02	307356		0.030	0.044	0.083	0.002	<0.001	0.0062	<0.001	0.024	<0.002	<0.02	<0.002	0.0045	0.004	0.020	0.001
MW03	29/09/2022	MW03	33831		0.35	0.07	0.63	0.07	0.03	0.30	0.02	0.06	<0.02	0.07	<0.02	0.04	<0.01	0.01	<0.01
MW05	5/10/2022	MW05	307356		0.09	<0.01	0.09	-	-	0.09	-	<0.01	-	-	-	-	-	<0.01	-
MW06	29/09/2022	MW06	33831		<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01
MW07	29/09/2022	MW07	33831		<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

					boxylic Acids					PFAS - Perfluoroalkyl Sulfonamide							PFAS - Fluorotelomer Sulfonic Acids			
					Perfluorodecanoic acid (PFDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.002	0.002	0.005	0.01	0.05	0.01	0.05	0.1	0.002	0.05	0.5	0.002	0.001	0.0004	0.0004	0.002
PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems																				
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems																				
PFAS NEMP 2.0 2020 Health Drinking Water																				
PFAS NEMP 2.0 2020 Recreational Water																				
Location Code	**Date**	**Field ID**	**Lab Report Number**	**Depth**																
GW101	29/09/2022	GW101	33831		<0.02	<0.02	<0.05	<0.1	<0.5	<0.1	<0.05	<0.1	<0.02	<0.05	<0.5	<0.02	<0.01	0.67	<0.02	<0.02
GW102	29/09/2022	GW102	33831		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.02	-
GW103	5/10/2022	GW103	307356		-	-	-	-	-	-	-	-	-	-	-	-	-	0.72	<0.02	-
GW104	29/09/2022	GW104	33831		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.02	-
GW105	5/10/2022	GW105	307356		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.02	-
GW106	29/09/2022	GW106	33831		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.02	-
MW01	5/10/2022	MW01	307356		-	-	-	-	-	-	-	-	-	-	-	-	-	0.08	<0.02	-
MW02	5/10/2022	MW02	307356		<0.002	<0.002	<0.005	<0.01	<0.05	<0.02	<0.05	<0.1	<0.004	<0.05	<0.5	<0.002	<0.001	0.020	<0.0004	<0.002
MW03	29/09/2022	MW03	33831		<0.02	<0.02	<0.05	<0.1	<0.5	<0.1	<0.05	<0.1	<0.02	<0.05	<0.5	<0.02	<0.01	0.02	<0.02	<0.02
MW05	5/10/2022	MW05	307356		-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	<0.02	-
MW06	29/09/2022	MW06	33831		<0.02	<0.02	<0.05	<0.1	<0.5	<0.1	<0.05	<0.1	<0.02	<0.05	<0.5	<0.02	<0.01	0.02	<0.02	<0.02
MW07	29/09/2022	MW07	33831		<0.02	<0.02	<0.05	<0.1	<0.5	<0.1	<0.05	<0.1	<0.02	<0.05	<0.5	<0.02	<0.01	0.05	<0.02	<0.02

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

				PFAS - Sums			PFAS - Perfluoroalkyl		PFAS -	PFAS - Fluorotelomer	
				Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL				0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0004	0.0004
PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems								2	632		
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems								0.13	220		
PFAS NEMP 2.0 2020 Health Drinking Water				0.07			0.07	0.07	0.56		
PFAS NEMP 2.0 2020 Recreational Water				2			2	2	10		
Location Code	**Date**	**Field ID**	**Lab Report Number**								
SW01	12/08/2022	SW01	33107	5.2	5.0	5.4	0.20	5.0	0.04	0.12	0.1
SW03	12/08/2022	SW03	33107	1.9	1.8	2.0	0.09	1.8	0.01	0.05	0.04
SW05	12/08/2022	SW05	33107	0.40	0.31	0.40	0.09	0.31	<0.01	<0.01	<0.02
SW06	12/08/2022	SW06	33107	2.1	1.7	2.3	0.35	1.7	0.05	0.14	0.06
SW11	12/08/2022	SW11	33107	1.6	1.4	1.8	0.24	1.4	0.03	0.09	0.04
SW14	12/08/2022	SW14	33107	0.66	0.54	0.67	0.13	0.53	0.01	<0.01	<0.02
SW16	12/08/2022	SW16	33107	1.5	0.26	1.6	1.3	0.15	0.11	<0.01	<0.02

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

					Inorganics	PFAS - Perfluoroalkyl Sulfonic Acids		PFAS - Perfluoroalkyl Carboxylic Acids	PFAS - Fluorotelomer Sulfonic Acids		PFAS - Sums		
					Moisture (%)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)
					%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0001
PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)						20	20	50			20		
Location Code	**Field ID**	**Depth**	**Date**	**Lab Report Number**									
SED01	SED01		12/08/2022	33105	47	0.0095	1.3	0.0040	0.0053	0.016	1.3	1.3	1.3
SED05	SED05		12/08/2022	33105	39	0.0023	0.034	<0.001	<0.001	<0.002	0.037	0.034	0.037
SED06	SED06		12/08/2022	33105	78	<0.005	0.15	<0.005	<0.005	0.017	0.15	0.15	0.17
SED07	SED07		12/08/2022	33105	37	0.0026	0.036	<0.001	<0.001	<0.002	0.038	0.036	0.038
SED11	SED11		12/08/2022	33105	18	<0.001	0.033	<0.001	<0.001	<0.002	0.033	0.033	0.033

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Ecological indirect exposure
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Industrial/ commercial (HIL D)

Tabulated Analytical Results
Table 6
Dam Analytical Results

					PFAS - Perfluoroalkyl Sulfonic Acids		PFAS - Perfluoroalkyl Carboxylic Acids	PFAS - Fluorotelomer Sulfonic Acids		PFAS - Sums		
					Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	Sum of PFHxS and PFOS	Sum of US EPA PFAS (PFOS + PFOA)*	PFAS (Sum of Total)
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL					0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01
PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems						2	632					
PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems						0.13	220					
PFAS NEMP 2.0 2020 Health Drinking Water					0.07	0.07	0.56			0.07		
PFAS NEMP 2.0 2020 Recreational Water					2	2	10			2		
Location Code	**Date**	**Field ID**	**Lab Report Number**	**Depth**								
DAM_B	21/10/2022	DAM_B	34169		0.58	1.8	0.07	0.13	0.06	2.4	1.9	2.6
DAM_S	21/10/2022	DAM_S	34169		0.59	1.8	0.07	0.12	0.06	2.4	1.9	2.6

Environmental Standards
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 90% - highly disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Freshwater - 95% - slightly to moderately disturbed systems
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Health Drinking Water
HEPA, Jan 2020, PFAS NEMP 2.0 2020 Recreational Water

Appendices

Appendix A

Letter from SA EPA

Environment Protection Authority
GPO Box 2607 Adelaide SA 5001
211 Victoria Square Adelaide SA 5000
T (08) 8204 2004
Country areas 1800 623 445

EPA GENI 62088

Krystle Mitchell
Senior Scientific and Environment Officer
South Australian Metropolitan Fire Service
By email: krystle.mitchell@sa.gov.au

Dear Ms Mitchell,

RE: REVIEW OF SITE CONTAMINATION REPORT – ACTION REQUIRED

Site: 97 Wakefield Street, Adelaide 5000 (CT 6181/979, CT 5943/887, CT 5782/242, CT 5943/888, CT 5346/689, CT 5761/799, CT 5761/798)

Thank you for providing the Environment Protection Authority (EPA) with a copy of:

- *Adelaide Fire Station Groundwater PFAS Assessment, South Australian Metropolitan Fire Service*, prepared by GHD and dated 14 October 2021.

The EPA has determined that the information contained in this report constitutes information that must be placed on the EPA Public Register under the provisions of section 109(3)(i) of the *Environment Protection Act 1993*. The key outcome of this determination is that this information will be identified by the EPA when responding to enquiries under the *Land and Business (Sale & Conveyancing) Act 1994*. The detail of this information will also be available to any interested person on specific enquiry to the EPA Public Register.

The EPA requests that copies of the following site contamination assessment reports referenced in the reviewed document are provided within **1 month** of the date of this letter:

- GHD 2017a. South Australian Metropolitan Fire Service, Preliminary Site Investigation (PSI), 99 Wakefield Street, Adelaide, Investigation of PFAS. January 2017, Job3318366, Document 30740.
- GHD 2017b. South Australian Metropolitan Fire Service, PFAS Investigation (for 5 MFS sites: Angle Park, Wakefield Street, Royal SA Yacht Squadron, Port Augusta and Whyalla stations). June 2017, Job 3318366, Document 54735.
- GHD 2017c. South Australian Metropolitan Fire Service, PFAS Investigation – Additional Testing Wakefield Street Fire Station. December 2017, Job Number 3318366, Document 62221.

Based on the information included in the reviewed report, the site has been deemed to be a Level 2 regulatory priority in accordance with the EPA Site Contamination Regulatory and Orphan Site Management Framework (2017)[1]. This priority level assists the EPA in selecting the appropriate regulatory approach and reporting timeframe to ensure that site contamination is managed effectively.

The reviewed report has identified Per- and Poly-Fluoroalkyl Substances (PFAS) contamination in soil, groundwater and surface water on-site. The report identifies potentially complete exposure pathways exist that require further assessment. As such, the EPA recommends that you engage a suitably qualified consultant to undertake the following:

- A detailed site investigation and risk assessment with the goals of:

[1] https://www.epa.sa.gov.au/files/13049_sc_orphan_sites.pdf

- Determine nature and extent of site contamination, both on and off-site.
- Identify and assess any potential risks to human health or the environment, both on and off-site.

- the submission of a report documenting the above investigation by 1 September 2022.

If you agree to undertake the above listed works it is requested that you submit written acknowledgement to the EPA within **1 month** stating as such. If you wish to discuss potential alterations to the recommended works or report delivery date please contact the EPA as soon as possible.

Please provide a copy of this letter to your engaged consultant to assist them in developing a scope of works for the site.

Fact sheets relating to your obligations under the *Environment Protection Act 1993* and how to engage a site contamination consultant be found at www.epa.sa.gov.au.

If you would like further assistance on this matter please contact Brooke Ryan on (08) 8204 8525 or at brooke.ryan2@sa.gov.au.

Yours sincerely

Hannah Custance

A/PRINCIPAL ADVISER, SITE CONTAMINATION

ENVIRONMENT PROTECTION AUTHORITY

Date: 23 November 2021

Cc: Dilara Valiff, Senior Environmental Consultant, GHD (by email: dilara.valiff@ghd.com)

Appendix B

Sampling and Analysis Quality Plan

Adelaide Fire Station

Sampling and Analysis Quality Plan (SAQP)

South Australian Metropolitan Fire Service

10 August 2022

→ **The Power of Commitment**

Project name		MFS Adelaide Fire Station SAQP & DSI						
Document title		Adelaide Fire Station | Sampling and Analysis Quality Plan (SAQP)						
Project number		12583428						
File name		12583428-REP-Adelaide Fire Station SAQP_Rev0.docx						
Status Code	**Revision**	**Author**	**Reviewer**		**Approved for issue**			
			Name	**Signature**	**Name**	**Signature**	**Date**	
S4	0	M Bald D Valiff	B Petticrew		B Petticrew		10/08/2022	
[Status code]								
[Status code]								
[Status code]								
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Table of Abbreviations

Abbreviation	Full form
AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ASC NEPM	*National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended 2013*
COC	Chain of Custody
COPC	Chemicals of Potential Concern
CSM	Conceptual Site Model
DO	Dissolved Oxygen
DQOs	Data Quality Objectives
EC	Electrical Conductivity
GAR	South Australian *Guidelines for the Assessment and Remediation of Site Contamination 2019*
GHD	GHD Pty Ltd
HEPA	Heads of Environment Protection Authorities Australia
HDPE	High-Density Polyethylene
IP	Interface Probe
JSEA	Job Safety and Environment Analysis
LDPE	Low-Density Polyethylene
LOR	Limit of Reporting
m bgl	Metres Below Ground Level
MFS	South Australian Metropolitan Fire Service
mg/L	Milligrams / Litre
MW	Monitoring Well
NATA	National Association of Testing Authorities
NEMP	PFAS National Environmental Management Plan Version 2.0 - January 2020
NEPC	National Environmental Protection Council
NHMRC	National Health and Medical Research Council
ORP	Oxidation-Reduction Potential
PFAS	Per- and Poly-Fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
ppm	Parts Per Million
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance and Quality Control
SA EPA	South Australian Environment Protection Authority
SAQP	Sampling and Analysis Quality Plan
SOP	Standard Operating Procedure

Abbreviation	Full form
SWL	Standing Water Level
TDS	Total Dissolved Solids
TOC	Top of Casing
TOPA	Total Oxidisable Precursors Assay
WQEPP	South Australian *Environmental Protection (Water Quality) Policy* 2015
µg/L	Micrograms / Litre
µS/cm	MicroSiemens / centimetre

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1. Introduction

GHD Pty Ltd (GHD) was engaged by the South Australian Metropolitan Fire Service (MFS) to prepare this Sampling and Analysis Quality Plan (SAQP) for the Adelaide Fire Station, located at 99 Wakefield Street, Adelaide (the site). The SAQP details further environmental investigation works proposed for the site to assist in determining the nature and extent of per-and-polyfluoroalkyl substances (PFAS) contamination as part of a Detailed Site Investigation (DSI).

The site location is presented on Figure 1.

1.1 Background

Historically, the MFS have used aqueous film-forming foams (AFFF) containing PFAS at the site during training activities. Foams containing PFAS have not been used at the site since 2016.

In 2016 – 2017, GHD completed limited investigations of the PFAS impacts in on-site soil and within the on-site drains and dam (sediment and surface water). PFAS contamination to soil, surface water, sediment and groundwater were identified but not delineated. It was also concluded that the concrete walls of the dam were likely to contribute PFAS concentrations to the retained water.

In July 2021, GHD completed a groundwater investigation, including the sampling and analysis of six existing groundwater monitoring wells, to determine the nature and extent of on-site groundwater PFAS impacts associated with historical MFS site activities. The investigation identified the presence of PFAS contamination in groundwater, but the extent of the impact was not delineated. It was considered that the PFAS-impacted groundwater would likely extend off-site with the potential to impact downgradient groundwater users and ecological receptors.

The site has been deemed by the EPA as a Level 2 regulatory priority in accordance with the EPA Site Contamination Regulatory and Orphan Site Management Framework (2017). This priority level assists the EPA to select the appropriate regulatory approach and reporting timeframe to ensure that site contamination is managed effectively. In the letter dated 23 November 2021, SA EPA requested that a DSI and risk assessment be completed and provided to the EPA.

1.2 Objectives

The objectives of this investigation are:

– To determine the nature and extent of PFAS site contamination, both on- and off-site.
– To assess the potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued industrial use.
– To assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.

1.3 Purpose and Scope of this SAQP

The purpose of the SAQP is to present the scope of work, methodologies, and sampling rationale to be utilised during the DSI works to meet the investigation objectives stated in Section 1.2 above.

1.4 Limitations

This report: has been prepared by GHD for South Australian Metropolitan Fire Service and may only be used and relied on by South Australian Metropolitan Fire Service for the purpose agreed between GHD and South Australian Metropolitan Fire Service.

GHD otherwise disclaims responsibility to any person other than South Australian Metropolitan Fire Service arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

If this report is required to be accessible in any other format, this can be provided by GHD upon request and at an additional cost if necessary.

2. Data Quality Objectives (DQO)

Systematic planning and verification is critical to the successful implementation of a contaminated site investigation and remediation project. The Data Quality Objective (DQO) process, as described in Australian Standard AS4482.1-2005 and National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM) 1999 (as amended in 2013) (No. 1) (ASC NEPM), has been applied to the proposed works program for the site. It involves a seven-step iterative planning approach to enable the project team to communicate the project goals and decisions, project constraints (e.g. time, budget) and an assessment of the project uncertainties and how they are to be addressed (Steps 1 to 6) as well as to optimise the project specific sampling and analysis plan (Step 7). The seven basic steps of the DQO process are as follows:

1. State the problem.
2. Identify the decision.
3. Identify inputs to the decision.
4. Define the study boundaries.
5. Develop a decision rule.
6. Specify limits on decision errors.
7. Optimise the design for obtaining data.

The output of the DQO process includes qualitative and quantitative statements developed in the first six steps of the process. They define the purpose of the data collection effort, clarify what the data should represent to satisfy this purpose and specify the performance requirements for the quality of information to be obtained from the data. The output from the first six steps is then used in the seventh step to develop the data collection design that meets all performance criteria and other design requirements and constraints.

The DQOs defined for the site were selected to ensure that the amount, nature and quality of data obtained during the instigation of the works program shall be sufficient to adequately assess significant risks to sensitive receptors associated with site contamination issues. The DQOs defined for the site, and the relevant sections of this SAQP in which they are described, are summarised in Table 1 below:

Table 1 Data Quality Objectives

Step		Statement	Section(s) of Report Where Addressed	
1	State the Problem	PFAS contamination has been identified in soil, groundwater, sediment, and surface water at the MFS Adelaide Fire Station that exceeds the applicable assessment criteria. The full nature and extent of PFAS contamination has not been determined. Additional environmental data is required: – To determine the nature and extent of PFAS contamination, both on- and off-site. – To assess the potential risks to human health and the environment associated with identified PFAS contamination on-site, in the context of continued industrial use. To assess the potential risks to human health and the environment associated with PFAS contamination migrating off-site, in the context of the relevant land uses and environments.	Project Background Previous Investigations	Section 1.1 Section 3.7
2	Identify the Decision	This SAQP has been developed to address the data gaps outline above by further delineating the extent of PFAS contamination in soils on-site, groundwater on-and-off site, potential migration of PFAS contamination off-site in sediments and stormwater, and to assess the potential risks of PFAS contamination to on-site and off-site receptors.	Objectives Sampling and Analytical Program	Section 1.2 Section 6
3	Identify Inputs to the Decision	Currently available information that will serve as inputs to the decision include the following: – Historical site information and analytical results presented in the previous reports listed in Section 3.7 below. – The current condition of the site. – Current extent and magnitude of PFAS contamination in groundwater. – The legislative requirements. – Conceptual site model (CSM). – Assessment Screening Criteria.	Site Information Previous Investigations CSM Assessment Screening Criteria	Section 3 Section 3.7 Section 4 Section 5
4	Define the Study Boundaries	The lateral study boundary is defined by the location of the existing and proposed off-site groundwater monitoring wells (Figure 6). The vertical study boundary is defined by the maximum depth of the monitoring wells (approximately 20 m below ground level (m bgl). The temporal study boundary is defined by the duration of this investigation.	Figure 6	Figure 6
5	Develop a Decision Rule	The PFAS National Environmental Management Plan (NEMP 2.0), 2020 (HEPA 2020); ASC NEPM (as amended 2013), relevant Australian Standards, and SA EPA guideline documents shall be used to guide decisions on the methodology and approach to assessing the site. The assessment criteria are to be adopted for screening of analytical data to determine potential risks associated with chemical concentrations in soils, groundwater, sediments, or surface water.	Assessment Screening Criteria	Section 5
6	Specify Limits on Decision Errors	Information is presented in the Quality Assurance/Quality Control (QA/QC) section of this SAQP.	Quality Assurance / Quality Control	Section 8

Step		Statement	Section(s) of Report Where Addressed	
7	Optimise the Design	The design of the SAQP has been based primarily on standard industry practices, GHD operating procedures, and the HEPA, NEMP 2018, and SA EPA guidelines. This assessment has been designed considering the results of previous investigations (Section 3.2) and is expected to satisfy the DQOs described in detail in Methodology Section 6.3. The chemicals of concern of this investigation (PFAS short suite) are based on information obtained during previous investigations and are considered sufficient to enable an assessment of potential risks based on the current and future land use scenarios.	Sampling and Analytical Program Investigation Methodology	Section 6 Section 7

3. Site Information

As part of the SAQP a review and update of available site information, including some aspects of the site history, has been undertaken.

3.1 Site Identification

Site information details are presented in below. The site location is presented on Figure 1, Appendix A.

Table 2 Summary of General Site Identification Information

Item	Detail
Site Address	99 Wakefield Street, Adelaide SA 5000
Certificates of Title	The site comprises land with the following Certificate of Title references: CT5346/689 CT5761/798 CT5761/799 CT5782/242 CT5943/887 CT5943/888 CT6181/979
Plan Parcels	The site comprises land with the following plan parcel references: F181532AL690 F181547AL705 F181546AL704 D112387AL80 F181510AL668 F181501AL659 F16490AL7
Current Zoning	Capital City (CC), City of Adelaide (mixed use of light industrial, commercial and residential)
Property Owner	South Australian Metropolitan Fire Service
Current Site Use	Operational Fire Station
Area	13,601 m^2
Site Elevation	46 m AHD

The information in Table 2 above has been obtained through the South Australian Property and Planning Atlas (viewed 18 July 2021).

3.2 Surrounding Land Use

A summary of the uses of the land surrounding the site is provided in Table 3 below.

Table 3 Summary of surrounding land use

Direction	Land Use
North	Land use immediately to the north of the site bounded by Wakefield Street is classified as public and commercial use with businesses including The Wakefield Hotel, Torrens University, Mr Bulogi Korean Restaurant, and multi-storey car parking. Hindmarsh Square (Mukata) is located approximately 500 m to the north of the site. The River Torrens (Karrawirra Parri) located approximately 1.3 km to the north of the site is the nearest surface water body.
East	Commercial properties are located immediately to the east of the site. Residential properties are located approximately 875 m to the east and south of Pulteney Street. Victoria Park (Pakapakanthi) is located 1 km to the east of site.
South	The South Australian Police (SAPOL) Headquarters are located on Angas Street, immediately adjacent to the southern boundary of the site. The Calvary Adelaide Hospital borders the south-eastern boundary of the site Further south of Angas Street, land use comprises both commercial and residential. Public open space used for sporting and recreational activities within the Adelaide Parklands is located approximately 1 km south of the site.
West	Commercial properties are located immediately to the west of the site. Educational facilities, including St Aloysius College and Chancery Lane Montessori Preschool are located immediately beyond Chancery Lane, approximately 100 m west of the site. Victoria Square (Tarntanyangga) is located approximately 500 m west of the Fire Station. The Adelaide Parklands, including Park 23 and the West Terrace Cemetery, is located approximately 1.5 km west of the site. Stormwater from the site is understood to discharge to a drainage channel in Park 23.

It is noted that historically, a Mitsubishi service centre was located on the land immediately south of the site, now occupied by the SAPOL Headquarters and the Calvary Adelaide Hospital.

3.3 Regional Topography and Hydrology

The site surface and surrounding land is relatively flat and forms part of the Adelaide Plains, between Gulf St Vincent to the west, and the Mount Lofty Ranges to the east. The site sits at an elevation of approximately 45 – 50 m AHD, with the land surface sloping gently to the west. The site and surrounding land within the Adelaide CBD largely comprises sealed surfaces (hardstand, bitumen, etc.) with the majority of stormwater discharging to the Adelaide Parklands to the west via the stormwater drainage pipes throughout the Adelaide CBD.

3.4 Regional Geology

A desktop search using the South Australian Resources Information Gateway (SARIG) map layers catalogue (1:100,000 Surface Geology Map – Adelaide, viewed 20 July 2022) indicated that surface geology at the site and surrounds comprises Pleistocene-aged alluvial/fluvial sediments of the Keswick Clay formation (Qpas) within the St Vincent Basin. The surficial soils are anticipated to consist of smectite-rich, grey-green clays, with red or yellow mottling and rare sand lenses.

3.5 Regional Hydrogeology

3.5.1 General

According to the Department of Water, Land and Biodiversity Conservation (DWLBC) Report (Gerges 2006), the site lies within ‘hydrogeological zone 4’, which contains up to three Quaternary and two Tertiary aquifers, and a fractured rock aquifer. Each Tertiary aquifer consists mainly of thin layers of fine sand with low yield. Most of the Quaternary and Tertiary aquifers become thin, shallow, and interconnected in the vicinity of the River Torrens (Karrawirra Parri). The shallow fractured rock aquifer near the River Torrens (Karrawirra Parri) contains groundwater of low salinity and significant yield. A search of the SARIG database reported shallow groundwater in the site and surrounds to range from 5 m below ground level (bgl) to 15 m bgl. Salinity of groundwater in the region

is reported to range from 1,500 mg/L to 3,000 mg/L total dissolved solids (TDS) indicating fresh to brackish water with a reported yield of 0.5 L per second to 2.5 L per second.

3.5.2 Registered Bore Search

The South Australian WaterConnect database (DEW 2021) was accessed in May 2022 to conduct a search of registered groundwater wells located within a 2 km radius of the site.

A total of 1,423 registered groundwater wells were recorded within 2 km of the site. Of these, 768 had data listed for registered purpose, and included:

- 13 wells were identified as having domestic purpose (potentially extractive).
- 96 wells were identified as having drainage purpose.
- 16 wells were identified as having environmental purpose.
- 1 well was identified as having environmental/ recreational purpose (potentially extractive).
- 16 wells were identified as having exploration purpose.
- 1 well was identified as having exploration/ observation purpose.
- 435 wells were identified as having investigation purpose.
- 2 wells were identified as having investigation/ managed aquifer recharge purpose.
- 1 well was identified as having investigation/ monitoring purpose.
- 2 wells were identified as having investigation/ observation purpose.
- 4 wells were identified as having irrigation purpose (potentially extractive).
- 1 well was identified as having investigation/ stock watering purpose (potentially extractive).
- 2 wells were identified as having managed aquifer recharge purpose.
- 112 wells were identified as having monitoring purpose.
- 55 wells were identified as having observation purpose.
- 1 well was identified as having observation/ recreational purpose (potentially extractive).
- 1 well was identified as having observation/ stock watering purpose (potentially extractive).
- 5 wells were identified as having recreational purpose (potentially extractive).
- 4 wells were identified as having town water supply purpose (potentially extractive).

Usage / purpose information was not registered for the remaining 655 wells within the 2 km radius enquiry area.

Total Dissolved Solids (TDS) data was available for 291 wells within the 2 km radius from the site. Of these groundwater well locations, 80 had recorded TDS data values below 1,200 mg/L. The lowest TDS value of 171 mg/L was reported for well number 6628-329, located approximately 420 m south-west of the site.

The location of groundwater wells in the vicinity of the site with potentially extractive uses have been reviewed, with relevant locations presented on Figure 2, Appendix A. All potentially extractive wells within a 2 km radius of the site appear to be located in close proximity of within the Adelaide Parklands surrounding the CBD. The closest extractive groundwater wells to the site are 6628-555 (approximately 750 m south of the site) and 6628-16184 (approximately 850 m east of the site). No extractive use groundwater wells were noted within 2 km of the site to the north-west (inferred direction of groundwater flow).

The data extracted from the WaterConnect search is provided in Appendix B.

3.6 Site Description

3.6.1 Site Inspection

A site inspection was undertaken by GHD on 2 June 2022. The location of site features and the general layout of the site are presented on Figure 3. Photographs taken during the site inspection are presented in Appendix C.

The site includes the following key buildings and infrastructure:

- The 'Main Building', located in the northern and eastern portion of the site comprises the site reception area, offices (above ground levels), basement carpark and ground-level fire truck dispatch area.
- The 'No. 2 Engine Room', located in the central-southern portion of the site. This building is used for the storage of fire trucks, fuels, and foams.
- A wash down bay is located immediately east of the No. 2 Engine Room which GHD understands is a contained system, with wash down water collected via a central drainage pit and discharged to sewer.
- Underground storage tanks (USTs) containing diesel fuel with above-ground dispensing bowsers are located in the central portion of the site, immediately to the north of the No. 2 Engine Room and washdown bay areas. It is understood that historical underground storage tanks at the site were removed in 2020 and were replaced with the current tanks.
- The 'Special Operations' building located in the north-western corner of the site, including facilities for firefighting PPE maintenance.
- The 'Training Tower', located in the central-western portion of the site, to the south of the Special Operations building. The Training Tower is utilised for various firefighting training exercises and has previously been identified as an area in which AFFF has been dispersed.
- The 'Comms Techs' building located in the westernmost portion of the site, which was noted to include storage of a small volume of paints and solvents within shelving units.
- The 'Logistics Building' located in the south-western portion of the site off Angas Street and noted to include storage of general materials / equipment used for MFS operations.
- Various storage sheds, including one at the northern end of the site, between the Main Building and Special Operations, and an additional shed / undercover area to the north of the Logistics Building that was historically used for the storage of PFAS-containing AFFF (see 'Historical AFFF Storage Area' on Figure 3. The undercover area to the north of the Logistics Building is currently used to store general materials, a forklift, and empty 205 L drums kept on-site for the purpose of containing hazardous materials from chemical spills or other incidents for immediate disposal via licensed waste disposal contractors.

The following additional observations were made during the site inspection:

- The site surface was observed to be relatively flat, with a gentle slope to the west (towards Chancery Lane).
- Majority of the site surface was sealed, with outdoor surfaces comprising pavers or concrete hardstand at ground surface. Small, unsealed garden bed areas exist in the central-northern, eastern and southern site boundaries.
- The sealed surfaces of the site were observed to be in good condition. Some sediment collection around stormwater drainage features was evident. No hydrocarbon staining, aside from minor staining in carpark spaces, was observed.
- There were no odours noted during the site inspection.
- Housekeeping processes at the site were observed to be well practiced, with on-site skip-style bins used for the disposal of general refuse and recycling materials.
- An on-site dam that exists in the western position of the site adjacent the Training Tower and Comms Techs buildings is understood to be used only for stormwater retention on-site and is not used for training purposes.
- In some areas of the site where a small number of pavers had been removed for maintenance works, it was evident that the hardstand at the site is underlain by sandy fill material (road base).
- The site is fenced and is not accessible to the public. All visitor entry is via reception areas from Wakefield Street or Angas Street, or via boom gate clearance for authorised personnel vehicles.

– Existing on-site groundwater wells were observed, with some headworks appearing in slight disrepair (disintegrating grout around flush gatic headworks).
– On-site stormwater infrastructure, including:
  - A concrete spoon drain located between the Main Building and No. 2 Engine Room, running east-west, with water discharging to a belowground drain discharging to the north (Wakefield Street).
  - A below ground drain to the east of the Special Operations and Training Tower buildings, running north-south, connecting with the central drain, and discharging out to Wakefield Street to the north.
  - Three stormwater pits to the north of the Training Tower building, to receive runoff from the Training Tower.
  - An ejector pit at the western-most end of the site, in the Comms Techs area that discharges stormwater out to Chancery Lane when at capacity.
  - Basement ejector pits for subsoil and building stormwater beneath the Main Building, located in the centre of the basement carpark and south-eastern area of the carpark.

3.6.2 Information from MFS Staff Survey

Following the site inspection, a survey questionnaire regarding the historical use of AFFF at the site was circulated to MFS staff. The survey was completed on 30 June 2022 by Firefighters and Officers with experience at the site, with the following key points noted:

– The questionnaire for the site was completed by multiple MFS personnel (A Shift Officers)' who began service at the MFS Adelaide Fire Station in the 1980s – 1990s and have worked there for periods of 30-35 years.
– It was identified that stormwater at the site is (and was historically) discharged to the north (to Wakefield Street) and west (to Chancery Lane).
– Stormwater at the site was historically diverted to the on-site dam and stored for re-use during training exercises. This practice has since been ceased and stormwater at the site is no longer harvested.
– It was identified that AFFF was used at the site since the opening of the current station (mid-1980's) and at the previous station that existed on the same site.
– Training exercises using AFFF were historically conducted weekly and occurred across the entire rear yard (see mark-up by MFS staff in Appendix D, and 'Historical AFFF Use' on Figure 3; The volume of AFFF used per training exercise was not known.
– AFFF was likely dispersed aerially over the whole rear yard (paved ground surface) during training exercises.
– The AFFF historically used at the site was branded '3M'.
– The last training exercise at the site using AFFF was considered likely to have taken place 'around 2016'.
– It was confirmed that wastewater resulting from training events was managed as stormwater runoff and was discharged off-site to Wakefield Street and Chancery Lane.
– AFFF was historically stored at the site in the shed area to the north of the Logistics Building in drums of 20 - 200 L capacity, and 1,000 L IBCs. The total volume of AFFF stored on the site at any given time prior to 2016 was around 5,000 L.
– Used / empty AFFF containers were disposed of to the general waste bin.
– It was identified that training areas of the old station (pre-1980's) where AFFF was used may have now been built on.

A copy of the survey questionnaire completed by MFS staff is provided in Appendix D.

3.7 Previous Investigations

The following environmental investigations have previously been completed by GHD in relation to the site:

– GHD, 2017a, South Australian Metropolitan Fire Service, Preliminary Site Investigation, 99 Wakefield Street Adelaide, Investigation of PFAS, January 2017.
– GHD, 2017b, South Australian Metropolitan Fire Service, PFAS Investigation, June 2017.
– GHD, 2017c, PFAS Investigation – Additional Testing, Wakefield Street Fire Station, December 2017.
– GHD, 2021, Adelaide Fire Station Groundwater PFAS Assessment, South Australian Metropolitan Fire Service.

Summaries of each investigation, and the findings/ recommendations, are presented below.

3.7.1 GHD (2017a) Preliminary Site Investigation

The Preliminary Site Investigation (PSI) scope included a desktop review of available current and historical information to assess the potential for PFAS contamination to exist, with subsequent targeted sampling in October 2016 that comprised:

– Limited soil sampling from three shallow soil bore locations (BH1-BH3) advanced by hand auger below the paved site surface. The soil bores were located adjacent to surface water inlets to assess surface water runoff impact to the soil in three locations: east of the chemical storage shed, south of Special Operations building and within the washdown bay. Samples were collected from shallow depths, approximately 0.1 – 0.4 m bgl.
– Two drain sediment samples: SED1 collected from the drain inlet of BH2 and SED2 collected from the washdown bay drain.
– Two storm water samples: SW01 collected from the surface water inlet located east of the chemical storage shed and SW02 collected from the washdown bay drain.

The findings of the PSI are summarised as follows:

– Several potential sources of PFAS were identified;
  - The washdown bay for washing of vehicles and hoses, and drainage associated with the training using AFFF at the fire station until 2007.
  - The training tower in the north-west corner of the site with random discharge of foam for historical training in this area.
  - Chemical storage shed located in the southern portion of the site with the storage of AFFF up to 2014.
– PFAS contamination was identified in all samples of soil, sediment and surface water collected and analysed as part of the PSI;
– The assessment criteria used in the 2017 PSI was the WA Government, Department of Environmental Regulation (WA, DER 2016) Interim Guideline on the Assessment and Management of PFAS. However, this guidance was superseded by the NEMP 2020 and NHMRC, 2019 guidelines (outlined in Section 5 and Table 5.2), which is adopted by GHD for 2017 PFAS result comparison.
– The subsurface soil results (Table 5) reported elevated PFAS concentrations exceeding either the NEMP 2020 ecological direct and/or indirect exposure criteria for PFOS in sample BH2_0.08-0.18 located adjacent to the surface water inlet running off from the training tower. The soil PFAS impacts have not been vertically or laterally delineated.
– The soil leachate results (Table 6) in one soil sample analysed (BH1_0.08-0.18) reported high leachable concentrations of PFOS (1.98 µg/L) above the NEMP 2020 freshwater criteria for 95 % species protection - slightly to moderately modified ecosystems, and for sum of PFOS and PFHxS (2.16 µg/L) exceeding the NEMP 2020 criteria for drinking water (0.07 µg/L) and NHMRC 2019 Recreational Water PFAS Guidelines (2 µg/L sum of PFOS and PFHxS).
– The surface water PFAS concentrations (sum of PFOS and PFHxS 25.4 µg/L in SW01 and 6.12 µg/L in SW02) exceeded the adopted NEMP 2020 human health criteria for drinking water and NHMRC 2019 Recreational Water (2 µg/L), indicating that water may present an unacceptable risk to human health and to ecological receptors.

Based on the above findings GHD (2017a) recommended the following:

– Conduct an inventory of the site to confirm the absence of any PFAS containing AFFF product.
– Conduct tests of fire truck tank water to assess whether residual PFAS resides in the trucks.
– Conduct further assessment of the nature and extent of groundwater contamination at the fire station through the installation of groundwater monitoring wells.
– Investigation of potential off-site surface water and groundwater contamination and potential risk to human health and ecological receptors.

3.7.2 GHD (2017b) PFAS Investigation

GHD (2017b) investigations completed in May-June 2017 included the following sampling:

– Sediment sampled from wastewater drains: SED1 from the training tower stormwater drain inlet and SED2 from the washdown bay drain inlet.
– Surface water sampled from the water storage dam: from surface of dam (DAM_S) and from bottom of dam (DAM_B).

The results are summarised as follows:

– The drain sediment samples PFOS concentration exceeded the adopted NEMP 2020 ecological indirect exposure criteria for PFOS.
– The dam water samples sum of PFOS and PFHxS concentrations (2.63 - 2.83 µg/L) exceeded the adopted NEMP 2020 human health criteria for drinking water (0.07 µg/L) and the Recreational Water criteria (2 µg/L), as well as freshwater (95 % species protection - slightly to moderately modified ecosystems) criteria (0.13 µg/L for PFOS), indicating that the water may present an unacceptable risk to human health and ecological receptors.

GHD (2017b) concluded that the dam water and sediments provide a direct exposure mechanism to human and terrestrial biota and an immediate potential source for groundwater contamination.

3.7.3 GHD (2017c) PFAS Investigation – Additional Testing

GHD (2017c) investigations completed in September and October 2017 included the following sampling:

– Sediment sample collected from an on-site drain south of Training Tower: DRAIN_S.
– Water samples collected from the on-site water storage dam after flushing / pressure cleaning: shallow water sample (DAM_S) and the deeper bottom water sample (DAM_B), to assess whether cleaning of the dam had made any significant impact to the level of PFAS. PFAS containing water was disposed appropriately.

The results are summarised as follows:

– The drain sediment sample PFOS concentration exceeded the adopted NEMP 2020 ecological indirect exposure criteria for PFOS.
– The dam water samples PFAS concentrations (sum of PFOS and PFHxS) ranged from 1.56 and 1.94 µg/L, exceeding the adopted NEMP 2020 human health criteria for drinking water (0.07 µg/L) and human health criteria for freshwater (95 % species protection - slightly to moderately modified ecosystems - 0.13 µg/L for PFOS), indicating that water may present an unacceptable risk to human health and ecological receptors. After the pressure cleaning of the dams, PFAS concentrations in the water were reduced by about half and were below the Recreational Water criteria.

GHD (2017c) concluded that the unsealed concrete walls of the dam were acting as an ongoing source of PFAS to the retained water. The TOPA PFAS results indicated an increasing trend of Sum of PFHxS and PFOS in shallow water samples, indicating the presence of compounds which represent the potential for ongoing PFAS contamination.

The dam has since been closed and is no longer used for training and aerosolising water. It has been used as a stormwater retention pit.

3.7.4 GHD (2021) Groundwater PFAS Assessment

An environmental investigation at the Adelaide Fire Station was undertaken to determine if PFAS associated with historical use of AFFF were present in groundwater beneath the site. An updated WaterConnect search was also conducted (2km radius), with a review of surrounding land use.

Groundwater samples were collected from six on-site wells that were installed on the site in 2020 by TMK Consulting Engineers, submitted to the laboratory and analysed for PFAS (Short Suite).

The 2021 Groundwater PFAS Assessment reported elevated PFAS concentrations in all six groundwater monitoring wells, with the results summarised as follows:

– PFOS and Sum of PFHxS and PFOS concentrations exceeded the adopted criteria (NEMP Recreational Water, NEMP Health Drinking Water) in four wells (GW101, GW103, GW104 and GW106).
– The elevated PFAS concentrations at wells GW101 (in the centre of the site) and GW103 (most down-hydraulic gradient well) were one to three orders of magnitude higher than in the other four wells and also exceeded the adopted health drinking water criteria for PFOA, the recreational criteria for PFHxS, PFOS and the Sum of PFHxS and PFOS and the ecological freshwater (95% species protection level) criteria for PFOS.
– Monitoring well GW101 reported the highest PFAS concentrations across the site, which was consistent with the historical use of PFAS containing foam in firefighting training at the nearby wash down bay.
– Elevated PFAS concentrations at GW103 were also consistent with a south-north flowing drain historically receiving runoff from the flushing of firefighting foam from hoses and pumps after their use at fire incidents and most down-hydraulic gradient location of this well.

Conclusions / recommendations / data gaps presented as part of the 2021 Groundwater PFAS Assessment included:

– The primary source of PFAS contamination no longer exists, however secondary sources of PFAS contamination remain and include contaminated soil, surface water and groundwater.
– The soil dry weight and leachate results reported elevated PFAS concentrations exceeding the nominated ecological and human health criteria and continue to represent an ongoing source of PFAS. The soil PFAS impacts have not been vertically or laterally delineated on-site.
– The concrete walls of the dam are likely to be contributing dissolved PFAS concentrations to the retained water.
– The surface water and sediments provide a direct exposure mechanism to human and the environment and an immediate potential source for groundwater contamination.
– The results suggest that the historical use of AFFF containing PFAS at the site has resulted in PFAS contamination to groundwater. Elevated PFAS concentrations were reported in groundwater sampled from all six on-site monitoring wells, with four wells exceeding the adopted the NEMP Health Drinking Water criteria.
– The reported PFAS concentrations in groundwater beneath the site were noted to constitute harm to groundwater that is not trivial. A Section 83A notification was submitted.
– It was considered that the impacted groundwater could potentially reach the River Torrens and the west parklands Park 23 creek at concentrations above the adopted Tier 1 ecological assessment criteria for freshwater (95% species protection level).
– It was recommended that further soil and groundwater investigations be undertaken to assess the on-site soil contamination and extent of off-site impacts to groundwater.

4. Conceptual Site Model

4.1 General

A conceptual site model (CSM) is a qualitative analysis tool which identifies the contamination sources, transport mechanisms, exposure pathways and receptors considered in a site-specific risk assessment. For an identifiable risk to exist, an exposure pathway must be present which requires each of the following to be identified:

– Presence of substances that may cause harm (SOURCE).
– Presence of a receptor which may be harmed (RECEPTOR).
– Existence of a means of exposing a receptor to the source (EXPOSURE PATHWAY) and whether exposure pathways are complete or incomplete.

A site-specific CSM has been developed based on GHD's understanding of the site setting, including geology, hydrogeology and surrounding land use in order to identify potentially significant source-pathway-receptor (SPR) linkages with respect to the potential risks in relation to the PFAS impacts at the site.

A tabular Conceptual Site Model (CSM) for the site, reviewed and updated as part of this SAQP, is presented in Table 4 below.

Table 4 Conceptual Site Model

Potential Source	Receptor	Pathway	Pathway Present?	Comments
PFAS-impacted soil, sediment and concrete.	Firefighters, workers and visitors to the MFS site.	Inhalation of contaminated soils.	Unlikely	PFAS concentrations detected in soil and sediment on-site to date were below the applicable Tier 1 assessment criteria for the protection of human health. PFAS concentrations in concrete are not known; however, concrete infrastructure across the site has a potential for being contaminated by PFAS based on the historical widespread use of PFAS-containing AFFF.
		Direct dermal contact with contaminated soils or concrete.	Unlikely	
		Incidental ingestion of contaminated soil or concrete dust.	Unlikely	
	Ecosystem at, and immediately surrounding, the site	Direct or indirect exposure to contaminated soils or sediments.	Possible	PFAS concentrations detected in soil and sediment exceeded the adopted Tier 1 interim ecological criteria for direct and/or indirect exposure.
		Migration of soils/sediments to surface water bodies via storm water.	Unlikely	The River Torrens (Karrawirra Parri) and the western Adelaide Parklands (including the Park 23 creek) are located approximately 1.3 km to the north (down-hydraulic gradient) and west of the site, respectively. The reported PFAS concentrations in soil and sediment exceeded the adopted ecological criteria and the soil contamination resulted in groundwater impact.
	Groundwater beneath the site	Migration through soil.	Yes	PFAS leaching from impacted soil and sediment has resulted in groundwater contamination. While water used during training activities and rainfall is collected as surface runoff and transferred into the storage dam, some water may also infiltrate the ground and reach the groundwater.
PFAS-impacted surface/storm water (from drains & storage dam).	Firefighters, workers and visitors to the MFS site.	Direct dermal contact with contaminated stormwater	Possible	Limited testing of storm water from the drain / pit inlets, the washdown bay drain, and from the water storage dam has identified PFAS concentrations exceeding assessment criteria for the protection of human health (drinking water) and/ or recreational water criteria, indicating that water may present an unacceptable risk to human health. Despite this, surface water within the inlets is not currently accessible by humans. The on-site dam has been closed and is no longer used for training and aerosolising water. It is currently only used as a stormwater retention pit.
		Incidental ingestion of contaminated stormwater	Unlikely	
	Ecosystem at, and immediately surrounding, the site	Stormwater runoff from site discharging to freshwater environments.	Unlikely	Limited on-site surface water testing has identified PFAS concentrations exceeding ecological criteria, indicating that water may present an unacceptable risk to ecological receptors. The River Torrens (Karrawirra Parri) and the western Adelaide Parklands (including the Park 23 creek) are located approximately 1.3 km to the north (down-hydraulic gradient) and west of the site, respectively. The distance to these receptors and dilution occurring during transport via stormwater drains would likely result in concentrations being below guidelines at the receptor.

Potential Source	Receptor	Pathway	Pathway Present?	Comments
	Recreation use of surface water bodies	Incidental ingestion of contaminated groundwater.	Unlikely	The closest water body is the River Torrens (Karrawirra Parri), which is not used for recreational swimming. Water activities (boating etc.) undertaken on the River Torrens are unlikely to result in consumption of impacted water at volumes that would pose a health risk from PFAS.
	Site soils	Surface/storm water infiltration	Yes	Impacted storm/surface water has likely resulted in contamination of site soils.
	Groundwater beneath the site	Surface/storm water infiltration	Unlikely	While storm water is collected as surface runoff and transferred into the storage dam, some water may also infiltrate the ground and reach the groundwater. However, given the depth to groundwater this is considered unlikely
PFAS-impacted groundwater.	People using groundwater for: domestic and drinking purposes.	Consumption of contaminated groundwater.	Possible	Although it is considered unlikely that groundwater would currently be used for potable purposes within the Adelaide CBD due to presence of reticulated water supply, some domestic bores have been identified within a 2 km radius of the site and potable use cannot be ruled out.
	People using groundwater for: irrigation of vegetable gardens and / or fruit trees with which they grow produce for consumption.	Consumption of fruit and vegetables irrigated by contaminated groundwater.	Possible	Although it is considered unlikely that groundwater would currently be used for irrigation purposes within the Adelaide CBD due to presence of reticulated water supply, some domestic / irrigation bores were located within a 2 km radius of the site, so that off-site use for irrigation purposes cannot be ruled out.
	People growing fruit and / or vegetables in open soil which may interact with groundwater.	Consumption of PFAS impacted fruit and / or vegetables.	No	The depth of groundwater precludes the possibility that fruit or vegetables in the nearby vicinity would interact with impacted groundwater.
	People using groundwater for recreational purposes such as filling of swimming pools.	Incidental ingestion of contaminated groundwater.	Unlikely	Groundwater use for recreational purposes such as filling of swimming pools is considered unlikely. The closest water body is the River Torrens (Karrawirra Parri), which is not used for recreational swimming. Water activities (boating etc.) undertaken on the River Torrens are unlikely to result in consumption of impacted water at volumes that would pose a health risk from PFAS.

Potential Source	Receptor	Pathway	Pathway Present?	Comments
	Down gradient off-site maintenance workers that contact PFAS contaminated groundwater.	Direct dermal contact or incidental ingestion of contaminated groundwater.	Unlikely	Whilst it is possible that off-site maintenance workers could incidentally ingest contaminated groundwater, it is unlikely that they'll ingest quantities detrimental to their health. The depth to groundwater is also likely beyond the reach of most construction activities.
	Ecosystem of the River Torrens and the Park 23 Creek (western Adelaide Parklands)	Migration via groundwater and discharge to surface water bodies.	Possible	The River Torrens (Karrawirra Parri) is located approximately 1.3 km to the north (down-hydraulic gradient). The reported PFAS concentrations in groundwater beneath the site exceeded the adopted Tier 1 ecological criteria by more than two orders of magnitude when sampled in 2021.

4.2 Data Gaps

The following data gaps to the CSM remain:

– PFAS impacted soil has been identified beneath the site, however, the vertical and lateral extent of contamination has not been determined.
– The potential for PFAS contamination being transported off-site via surface water discharge to the north and west of the site has not been investigated.
– PFAS contamination in concrete/pavers and the associated PFAS flux from these materials has not been assessed.
– The off-site and downgradient extent of PFAS contamination in the groundwater has not been determined.

5. Assessment Screening Criteria

PFAS is the key contaminant of concern being address by this environmental investigation. As such, the assessment criteria for this investigation were adopted from the following documents:

– HEPA, 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP).
– NHMRC, 2019, Guidance on Per and Polyfluoroalkyl (PFAS) in Recreational Water, National Health and Medical Research Council, Canberra 2019
– NHMRC/NRMMC, 2011, Australian Drinking Water Guidelines 6, Version 3.6 Updated March 2021, National Water Quality Management Strategy, National Health and Medical Research Council and Natural Resource Management Ministerial Council, Canberra, 2021, (ADWG).

The assessment was also undertaken in general accordance with the following guidelines and policy documents:

– HEPA, 2020, PFAS National Environmental Management Plan (Version 2.0), Heads of Environment Protection Authorities Australia and New Zealand, January 2020, (PFAS NEMP).
– ANZG, 2018, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, online resource www.waterquality.gov.au/anz-guidelines, Australian and New Zealand Governments, updated 26 July 2021, (AWQG).
– Environment Protection (Water Quality) Policy 2015 (WQEPP), Version 1.7.2020, Government of South Australia, updated 2020.
– SA EPA, 2019a, Guidelines for the Assessment and Remediation (GAR) of Site Contamination, Environment Protection Authority, South Australia, November 2019.
– SA EPA,2019b, Guidelines for Regulatory Monitoring and Testing – Groundwater Sampling.

5.1 Soil

As outlined in the NEMP 2.0, the following PFAS assessment criteria have been adopted (Table 5) for the assessment of soil:

Table 5 Adopted PFAS Assessment Criteria - Soil

Exposure Scenario	Land Use	Sum of PFOS[1] and PFHxS[2]	PFOA[3]	Comments and Reference Document
Human health guideline values	Commercial / Industrial (HIL D)	20 mg/kg	50 mg/kg	HEPA 2020
Ecological indirect exposure	All land uses	0.14 mg/kg	-	HEPA 2020. For intensively developed sites (such as the MFS Adelaide Fire Station) with no secondary consumers and minimal potential for indirect ecological exposure, a higher criterion of up to 0.14 mg/kg is appropriate.

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid

The PFAS NEMP (Section 8, 2020) provides nationally agreed guideline values that are to be used to inform site investigations. The guidelines have been derived based on existing nationally agreed long standing Australian processes.

The ecological guidelines have been applied to provide a preliminary assessment of potential ecological risks for organisms through direct and indirect exposure; however, as the PFAS NEMP states, the indirect exposure value may be over-protective for a number of considerations, including where the area of exposed soil is too small to have any material impact on the food chain transfer to higher order organisms, or in areas where the contaminated area does not support high value foraging habitat, or secondary consumers are effectively absent from the site.

The site use is that of a fire station, which discourages the presence of higher order organisms such as birds and mammals. During the site inspection and following a review of information provided by MFS staff (see Section 3.6 above), there was no evidence of potential food production on the site (i.e. fruit trees, vegetable gardens, chickens, etc.) The site-specific characteristics justify the use of a higher value (0.14 mg/kg) as the trigger for a detailed investigation of risk.

5.2 Groundwater and Surface Water

To assess the contamination status of groundwater at a site, the GAR (SA EPA, 2019a) provides a four-step process to determine the environmental values of groundwater and to determine if actual or potential harm to groundwater that is not trivial has occurred. The four-step process described in the Guideline on the assessment and remediation of site contamination is described in Table 6.

Table 6 Four-step process for determining environmental values of groundwater

Process	Assessment
Step 1: Apply Table 3 of WQEPP (2015) Schedule 1, based on TDS ranges	Calculated TDS results for groundwater samples collected from the site in July 2021 ranged between 6,269 mg/L and 8,903 mg/L, indicating saline groundwater beneath the site that is suitable for use by primary industries for livestock watering and aquaculture for human consumption, but not suitable for recreation, potable use or irrigation of crops (SA EPA, 2019a). The groundwater data in the WaterConnect database (Step 3) indicates that out of 291 wells with available TDS data, 80 wells reported TDS values below 1,200 mg/L.
Step 2: Assess and identify surface water bodies within a 2 km buffer of the site	Surface water bodies within 2 km of the site include the River Torrens (Karrawirra Parri), located approximately 1.3 km north of the site, and the Park 23 Creek (Adelaide Parklands), located approximately 1.5 km west of the site.
Step 3: Review registered groundwater users in the WaterConnect database	The registered bore search identified 1,423 registered bores within a 2 km radius of the site. Registered purposes (with number of wells in parentheses) were as follows: domestic (13), drainage (96), environmental (16), environmental/ recreational (1), exploration (16), exploration/ observation (1), investigation (435), investigation/ managed aquifer recharge (2), investigation/ monitoring (1), investigation/ observation (2), irrigation (4), investigation/ stock watering (1), managed aquifer recharge (2), monitoring (112), observation (55), observation/ recreation (1), observation/ stock watering (1), recreational (5), and town water supply (4). Usage / purpose information was not registered for 655 of the wells in the 2 km enquiry area.
Step 4: Application of the EPA recognised criteria for the most sensitive environmental value	The most sensitive environmental values to be applied to the site are Health Recreational Water, Health Drinking Water and Aquatic Ecosystems (fresh).

Based on the assessment outlined in Table 6, the groundwater criteria have been selected to protect the relevant environmental values identified for groundwater underlying the area of investigation.

For the purpose of this assessment, criteria have been included to:

– Assess the potential risk to people using groundwater for domestic and drinking purposes, (i.e., potable use).
– Assess the potential risk to users of groundwater for irrigation of fruit trees and vegetable gardens.
– Assess the potential risk to freshwater systems. Given the River Torrens (Karrawirra Parri) and the west parklands Park 23 creek receive various inputs from stormwater, it is considered to be a slightly to moderately modified ecosystem. Therefore, the 95% Species Protection value has been selected to assess the effects of PFAS chemicals on aquatic organisms.

The values for the adopted screening/ investigation levels from this source, which are considered to protect potentially complete source receptor linkages, are summarised in Table 7.

Table 7 Adopted PFAS Interim Screening Criteria (Surface Water and Groundwater)

Exposure Scenario	PFOS[1]	PFHxS[2]	Sum of PFOS and PFHxS	PFOA[3]	Source
Health Recreational Water[4]	2.0 µg/L	2.0 µg/L	2.0 µg/L	10 µg/L	PFAS NEMP 2.0 (2020)
Health Drinking Water	0.07 µg/L	0.07 µg/L	0.07 µg/L	0.56 µg/L	PFAS NEMP 2.0 (2020)
Freshwater 95% Species Protection – Slightly to moderately modified ecosystems	0.13 µg/L	-	-	220 µg/L	PFAS NEMP 2.0 (2020)

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid
[4] Based on NHMRC (2019)

5.3 Sediment

In the absence of specific screening criteria for sediments in the PFAS NEMP 2.0 (2020), the PFAS NEMP HIL D soil criteria should be adopted for comparison of on-site sediments results. These are protective of commercial workers, so these are conservative for intermittent exposure scenarios. These values are presented in Table 8 below.

Table 8 Adopted PFAS Human Health Assessment Criteria - Sediment

Exposure Scenario	Land Use	Sum of PFOS[1] and PFHxS[2]	PFOA[3]	Comments and Reference Document
Human health guideline values	Commercial / Industrial (HIL D)	20 mg/kg	50 mg/kg	HEPA 2020

Notes:
[1] PFOS – perfluorooctane sulfonate
[2] PFHxS – perfluorohexane sulfonate
[3] PFOA – perfluorooctanoic acid

6. Sampling and Analytical Program

This section outlines the sampling design and analytical requirements for the collection of environmental data for the investigation. A judgement-based sampling design has been adopted based on the available historical information and technical knowledge of the site to address the data gaps and the DQO referred to in Section 3.

6.1 Soil

6.1.1 Soil Sampling Locations Rationale

It is proposed that fifteen (15) soil bores are drilled across the site for sampling to enable determination of the nature and extent of PFAS contamination in soils on-site.

Proposed soil bore investigation locations are presented on Figure 4.

Table 9 Proposed Soil Bore Location Rationale Table

Soil Bore Location No.	Proposed Soil Bore ID	Location Rationale	Comments / Logistics
1	BH04	Targeting stormwater discharge point to Chancery Lane	Requires concrete coring / paver removal, tight access, possible underground service constraints. Likely hand augering only.
2	BH05	Vertical delineation of PFAS impact identified in fill material at BH02 (2016 soil bore)	Requires paver removal / concrete coring and appropriate reinstatement.
3	BH06	Targeting water storage dam and historical PFAS AFFF use within the Training Tower	
4	BH07	Targeting historical PFAS AFFF storage area	Requires paver removal / concrete coring and appropriate reinstatement. Access needs to be minimally invasive to carpark users.
5	BH08		
6	BH09	Vertical delineation of PFAS impact identified in fill material at BH01 (2016 soil bore)	
7	BH10	Targeting stormwater discharge point to Wakefield Street	Grassed area at ground surface, drilling rig access should be possible; however, appropriate exclusion zone required re: public access risk.
8	BH11	Targeting down-gradient side of stormwater drain to Wakefield Street	Requires concrete coring / paver removal, possible underground service constraints.
9	BH12		
10	BH13	Targeting area of historical PFAS AFFF usage / storage	
11	BH14	Targeting soils adjacent stormwater flow channel (spoon drain and underground pipes) in central portion of site	Requires concrete coring / paver removal, possible underground service constraints, close proximity to existing USTs.
12	BH15		
13	BH16		
14	BH17	Garden area along Bath Lane. Assessment of background soil condition	Garden bed area.
15	BH18	Targeting area of historical PFAS detection in shallow fill material (BH03, 2016 soil bore)	Presence of USTs limits potential intrusive investigation to shallow fill material via hand auger only.

It is proposed that all soil bores be advanced to 2.5 m bgl, with the exception of BH18 (shallow fill sample only).

6.1.2 Soil Sample Laboratory Analysis

Soil samples are to be collected at the depths prescribed in the Investigation Methodology (see Section 7). It is proposed that from each soil bore, one sample from shallow fill material, and one sample from underlying natural (at least 0.5 m bgl) be submitted for laboratory analysis of PFAS (Short Suite). It is anticipated that this would result in analysis of approximately 30 primary soil samples, noting that further analysis may be requested to delineate PFAS impacts should it be required.

6.2 Groundwater

6.2.1 Off-Site Groundwater – Registered Bores Search

On 12 July 2022, GHD field staff conducted a physical search in the streets surrounding the site for existing groundwater wells that may be useful to include in the proposed groundwater sampling program for the purpose of delineating the off-site extent of PFAS contamination (if required).

Seventeen wells surrounding the site were identified as potentially suitable based on a review of well construction information on WaterConnect. The following observations were made:

– 7 existing off-site wells were positively identified, gatics lifted, inspected, and confirmed to be in good condition.
– 10 existing off-site wells could not be located and are presumed lost / destroyed or require further investigation of various headworks in vicinity.

Locations of the wells looked-for are presented on Figure 6, categorised by their lost / found status. Based on a review of the existing groundwater data for the site, it is considered that these existing wells would only be sampled in a subsequent phase of works to the initial DSI groundwater scope as described in 6.2.3 below, taking a staged approach to the determination of nature and extent of PFAS impacts to groundwater.

6.2.2 Groundwater Wells Installation Rationale

It is proposed that one new on-site groundwater monitoring well (MW01) and six new off-site groundwater monitoring wells (MW02 - MW07) immediately surrounding the site are drilled and installed to aid in the determination of the nature and extent of PFAS contamination in groundwater. Proposed off-site groundwater wells locations rationale is presented in Table 10.

Table 10 Proposed Off-site Groundwater Wells Installation Rationale

Proposed Well ID	Distance from Site	Location Rationale
MW01	In north-west portion of the site	Down-hydraulic-gradient of most PFAS impacted on-site groundwater monitoring well GW101.
MW02	150 m north-west of site along Gawler Place	Down-hydraulic-gradient from site, assuming groundwater flow north/north-west. Assuming less traffic along Gawler Place and easier access for undertaking drilling works.
MW03	60 m north of site along Divett Place	Down-hydraulic-gradient from site. Assuming less traffic along Divett Place and easier access for undertaking drilling works.
MW04	50 m north of site along Roper Street	Down-hydraulic-gradient from site, to provide a better understanding of nature and extent of PFAS contamination in the northerly direction. Assuming less traffic along Roper Street, allowing for easier access when undertaking intrusive works.
MW05	13 m west of site, along Chancery Lane	Down/cross hydraulic-gradient from site, where stormwater discharges out onto Chancery Lane, to the west of the site. Installing a well in this general location will provide a better understanding of the nature and extent of contamination in the westerly direction.

Proposed Well ID	Distance from Site	Location Rationale
MW06	65 m south-east of southern site boundary, along Princess Street	Up-hydraulic-gradient from site, to provide background contamination status of groundwater flowing onto the site from the south-eastern direction.
MW07	65 m east of site along Pulteney Street	Up-hydraulic-gradient from site, to provide background contamination status of groundwater flowing onto the site from the eastern direction.

It is noted that the above proposed wells locations are subject to permitting by the Adelaide City Council, DEW and presence of the underground services within the vicinity of the investigation area.

6.2.3 Groundwater Sampling and Analytical Program

Following installation of the groundwater wells, it is proposed that a Groundwater Monitoring Event (GME) is conducted, including:

– Gauging of standing water levels (SWLs) and total well depth at seven on-site groundwater wells and six off-site groundwater wells.
– Sampling of one new (MW01) and six existing on-site groundwater monitoring wells (GW101 – GW106), with primary samples submitted for PFAS (Short Suite) analysis.
– Sampling of six newly installed off-site groundwater monitoring wells (MW02 – MW07), with primary samples submitted for PFAS (Short Suite) analysis.

Following receipt of the analytical results, consideration will be given to whether sampling any of the identified existing off-site groundwater wells, or installation of additional new monitoring wells to further delineate any potential PFAS impact, is required.

Proposed groundwater investigation locations are presented on Figure 5 (on-site) and Figure 6 (off-site).

6.3 Sediment and Storm Water

The sediment and storm water sampling program will be undertaken during a substantial rainfall event on a day with >10 mm rainfall forecast for Adelaide by the Bureau of Meteorology. It is considered necessary that the site be observed during a rainfall event by GHD environmental engineers / scientists to determine which sampling locations are most useful / representative of storm water and/ or sediments that would potentially be discharged from the site.

Twenty (20) potential on-site (or immediately off-site) sediment and storm water (combined) sampling locations have been identified via a combination of historical sampling locations, and inspection of on-site storm water/ drainage infrastructure by GHD field staff.

It is proposed that up to 15 of the identified 20 locations would have sediment and storm water samples collected during a rainfall event. The remaining five are considered alternate locations that may be sampled after site observations of runoff.

Potential sediment and storm water investigation locations are presented on Figure 4. Identification details for the 20 potential sampling locations are provided in Table 11 below.

Table 11 Potential Sediment and Storm Water Sampling Locations

Sampling Location No.	Proposed Sample ID	Sediment Sample Possible?	Location Type	Comments / Logistics
1	SW01	Likely	Stormwater Pit	Previously sampled as part of GHD 2016 - 2017 investigations.
2	DAM_B	Likely	Dam	Previously sampled as part of GHD 2016 - 2017 investigations. Foot valve pump and tubing required to sample.
3	DAM_S	No	Dam	Previously sampled as part of GHD 2016 - 2017 investigations. Swing sampler required to sample.
4	DRAIN	Unlikely	Stormwater Drain	Previously sampled as part of GHD 2017 investigations. MFS staff assistance required to remove portion of grate.
5	SW03	Likely	Stormwater Pit	Pump installed in pit to discharge overflow to Chancery Lane. MFS staff assistance required to remove grate.
6	SW04	Unlikely	Stormwater Drain	Drain receiving storm water prior to discharge to Chancery Lane. MFS staff assistance required to remove portion of grate.
7	SW05	Likely	Stormwater Pit	Pit receiving storm water drainage from area of potential historical PFAS-AFFF usage. MFS staff assistance required to remove grates.
8	SW06	Likely	Stormwater Pit	
9	SW07	Likely	Stormwater Pit	
10	SW08	No	Stormwater Pipe Outlet (Discharge)	Stormwater discharge pipe to Wakefield Street.
11	SW09	Likely	Stormwater Pit	Pit adjacent drain discharging to Wakefield Street. MFS staff assistance required to remove grate.
12	SW10	Unlikely	Stormwater Drain	Drain location with water flowing north (approximate) for discharge to Wakefield Street. MFS staff assistance required to remove portion of grate.
13	SW11	Likely	Stormwater Pit	Pit receiving storm water drainage from area of potential historical PFAS-AFFF usage. MFS staff assistance required to remove grate.
14	SW12	Unlikely	Stormwater Drain	Drain location with water flowing north (approximate) for discharge to Wakefield Street. MFS staff assistance required to remove portion of grate.
15	SW13	Unlikely	Stormwater Drain	Basement carpark - western entry/exit. MFS staff assistance required to remove portion of grate. Possible 'background condition' stormwater location.
16	SW14	No	Spoon Drain	Surface spoon drain, vicinity of wash-down activities, will require substantial rainfall event for sufficient sample volume.
17	SW15	Likely	Wash Bay Pit	Vicinity of wash-down activities, discharge to sewer, MFS staff assistance required to remove grate.
18	SW16	Likely	Stormwater Pit	Basement carpark - central. Will require MFS staff assistance to remove and replace plate cover. Swing sampler required to collect sample.
19	SW17	Likely	Stormwater Pit	Vicinity of wash-down activities, MFS staff assistance required to remove grate.

Sampling Location No.	Proposed Sample ID	Sediment Sample Possible?	Location Type	Comments / Logistics
20	SW18	Unlikely	Stormwater Drain	Basement carpark - eastern entry/exit. MFS staff assistance required to remove portion of grate.

After receipt of the analytical results for the initial round of sediment and storm water sampling, a review will be undertaken to determine the need for sampling of off-site storm water locations. If PFAS impacts are identified in storm water leaving the site, sampling of potential off-site locations to the west of the site down Wakefield Street towards the Park 23 Creek (western Adelaide Parklands) where site stormwater is inferred to flow, may be recommended.

7. Investigation Methodology

This section presents the methodology of investigation activities including field works, data collection methods, and subsequent reporting.

All investigation activities will be undertaken in accordance with state guidance and standards, and GHD Standard Operating Procedures (SOPs) and the guidelines outlined in Section 5.

7.1 Community Engagement

GHD, in conjunction with the MFS, will implement a community engagement and consultation plan and provide updates to relevant off-site property owners in the surrounding area in relation to the assessment works and ongoing management of PFAS contamination associated with the site, including:

– Preparation and delivery of letters to relevant property owners detailing the proposed assessment works, including timing and possible impacts (access, noise etc.).
– Engaging with individual property owners on the usage of groundwater extraction bores (if required).

7.2 DSI Field Program

Investigation methodology for the various stages of the DSI field program are summarised in Table 12 below.

Table 12 DSI Field Investigation Methodology

Task	Method
General	Design and implementation of site-and-task-specific Job Safety and Environmental Assessments (JSEAs) for each field mobilisation. These include identifying site-specific hazards. A Health, Saferty and Envionmental Managememt Plan (HSEMP) will be produced prior to off-site works for groundwater well installation and sampling. Logistical organisation including obtaining the relevant permits and access requirements with MFS and other parties (i.e. Adelaide City Council for proposed off-site groundwater monitoring well installation works and subsequent sampling). Engagement of appropriate drilling, surveying, service locating, vacuum truck / non-destructive digging (NDD) and waste disposal contractors to undertake the intrusive works.
Intrusive Soil Investigations	GHD will undertake intrusive soil investigations in accordance with the following: – Implement requirements of JSEA and any permits. – Liaison and coordination of fieldwork with MFS and engaged subcontractors. – Clearance of all sample locations by an accredited service locator. – Soil bores will be drilled / advanced via a combination of concrete coring, hand auger and direct push drilling methodologies. – Where the direct push drilling methodology is used, high density polyethylene (HDPE) core liners will be used to minimise the risk of PFAS cross-contamination. – Soil samples will be collected from extracted soil cores by hand with a pair of clean nitrile gloves. When sampling directly from the hand auger, samples will be taken from soil not in direct contact with the equipment surfaces. – Discrete soil samples will be collected at each soil bore location from surface (immediately under hardstand) (0.0 – 0.2 m bgl), near-surface (0.3 - 0.5 m bgl) and at 1.0 m intervals thereafter, or where lithological changes are observed or vertical delineation of previously identified impacts are required. – Logging of the soil bores will be undertaken by an environmental scientist to assess the underlying geology and contaminant indicators. – Soil samples will be placed in laboratory-supplied jars and placed immediately in a chilled cooler and transported to the analytical laboratories under chain of custody documentation protocols and chilled conditions. – Drilling spoil will be either returned to the bore or placed in drums, sealed and stored at an on-site location agreed with MFS until off-site disposal can be arranged to a suitably licenced facility.

Task	Method
	– Collection of QA/QC samples including intra-laboratory duplicate, inter-laboratory duplicate (split) samples, and rinsate blanks.
Groundwater Monitoring Well Installation	Installation and development of permanent groundwater monitoring wells as part of the DSI scope is to be undertake in accordance with the following: – Installation of permanent groundwater monitoring wells as presented in Table 5.1. – Drilling locations will be assessed and cleared by an accredited service locator prior to the commencement of works. – Non-destructive digging (i.e. hand auger or vacuum truck methodology) will be used as required to ensure safe initial borehole advancement in the vicinity of potential underground services. – Target drilling depth for the groundwater wells will be between 15 – 20 m bgl, based on review of existing wells constructed on the site and surrounds. – 50 mm Class 18 PVC casing will be used for the well installation, with the 3 m slotted screen interval installed at the target depth. – Constructed as per Minimum Construction Requirements for Water Bores in Australia (4th Edition, 2020). – The groundwater wells will be developed via pumping or bailing after construction (where appropriate), with the well casing pumped out to remove loose sediment created by the drilling and construction process. Where possible, water physio-chemical parameters [electrical conductivity (EC), dissolved oxygen (DO), temperature, pH, oxidation / reduction potential (ORP), and turbidity] will be measured and recorded in the field to confirm removal of any added water (if any) and stabilisation of parameters. – A licensed surveyor will survey the location of each of the recently installed groundwater monitoring wells to Australian Map Grid (AMG) coordinates to within 0.01 m. At the same time the level of the measuring point marked at the top of the well casing (as well as the adjacent ground surface) will be measured to Australian Height Datum (AHD) to within 0.001 m. For consolidation of location data, the top of casing (TOC) elevation of the six existing on-site groundwater monitoring wells will also be re-surveyed. – Development and purge water will be placed in drums, sealed and stored at a location agreed with MFS until off-site disposal can be arranged to a suitably licenced facility. – Groundwater sampling to be completed greater than seven days post monitoring well development.
Groundwater Sampling	Groundwater sampling will be undertaken in accordance with the following: – Gauging and inspection of newly installed, and existing monitoring wells using an oil/water interface probe (IP) to measure standing water levels (SWLs) and total well depths. – Groundwater sampling of newly installed, and existing, monitoring wells using no flow sampling techniques (HDPE sleeve sampler), and including measurement of field parameters – pH, EC, DO, turbidity, ORP (corrected where required) and temperature.
Surface Water and Sediment Sampling	The following will be undertaken for the surface/storm water and sediment sampling program: – Surface/storm water samples will be taken by grab methodology directly into laboratory-supplied containers, or samples will be collected using an extendable sampling pole (telescopic / swing sampler) where required. – Sediment samples collected from the nominated pits and drains will be collected when water levels are lowest, preferrable after a significant rainfall event. This will be achieved using a small trowel and/or shovel or by hand using nitrile gloves. Sediment samples from deeper pits/drains, where a hand trowel is not suitable, will be collected using a Van Veen Grab Sampler or similar. – A full description of the surface/storm water and sediment monitoring location and condition will be documented (photographs may be taken to assist in this process). – Field pH, EC, DO, turbidity, ORP (corrected where required) and temperature readings will be taken using a calibrated water quality meter during the surface water sampling.
Decontamination	**General guidance** Samples can be contaminated with PFAS from a range of products, including new clothing, footwear, PPE and treated fabrics stain and water- resistant products, sunscreen, moisturisers, cosmetics, fast food wrappers, polytetrafluoroethylene (PTFE) materials (such as Teflon©), sampling containers with PTFE-lined lids, foil, glazed ceramics, stickers and labels, inks, sticky notes, waterproof papers, drilling fluids, decontamination solutions and reusable freezer blocks. These should not be worn or used during any stage of sampling (at site, during transport etc.).

Task	Method
	If information confirming that field consumables and decontamination detergents is PFAS free is not available, the consumable should not be used until the supplier can confirm it is PFAS-free. If this information is not available, the product should be tested for the presence of PFAS, and only used where it has been demonstrated to be PFAS-free. Where possible undertake field sampling by completing monitoring in areas where low concentrations of PFAS are likely and then move toward wells of higher concentration to reduce the chance of cross-contamination. **Handling** The following should be applied: – Sampling personnel should wash their hands with plain soap and rinse thoroughly in tap water. – Use laboratory supplied sample containers suitable for requested analysis LOR requirements, typically polypropylene or HDPE. – Avoid using sampling and monitoring equipment that may contain PTFE (PTFE based compositions include Teflon®). – Ensure that Teflon®-coated materials and aluminium foil do not come into contact with the sample. – Chemical or gel-based coolant products to keep samples cool should not be used. – Recommended equipment for groundwater sampling includes HDPE sleeve samplers. – Consumable sampling equipment should not be reused. Decontamination techniques employed for this testing will be carried out in accordance with GHD's SOPs.

7.3 Reporting

At the completion of the implementation of this SAQP, GHD will complete the following reporting tasks:

Preparation of a DSI and Tier 1 Risk Screening Report that will outline the works completed and findings of the investigation. The report will include:

– Site description, setting and background information.
– Description of all sampling and works undertaken as part of the DSI.
– Results of the field and laboratory investigations and comparison with adopted criteria.
– Quality control and assurance discussion.
– An updated CSM, detailing the Source-Pathway-Receptor linkages, existing sources of contamination, potential receptors, and exposure pathways.
– A Tier 1 risk assessment will be completed, which will identify any key remaining data gaps and provide targeted recommendations to mitigate any identified risks.

The report will be prepared in accordance with the GAR and ASC NEPM (as amended 2013); and will be provided in draft to MFS for review, comment and endorsement prior to finalisation.

8. Quality Assurance / Quality Control

The quality assurance/quality control (QA/QC) procedures adopted for the DSI works are based on ASC NEPM (as amended 2013), and HEPA (2020) PFAS NEMP 2.0.

Quality assurance (QA) involves the actions, procedures, checks and decisions undertaken to ensure the representativeness and integrity of samples and accuracy and reliability of analytical results. Quality control (QC) involves protocols to monitor and measure the effectiveness of QA procedures (ASC NEPM, 2013).

8.1 Field Program QA/QC

8.1.1 Field Quality Assurance Procedures

All field work will be conducted with reference to the NEMP (HEPA 2020) and GHD's Field Standard Operating Procedure (SOP) documents, which ensures all samples are collected by a set of uniform and systematic methods, as required by GHD's QA system.

Key requirements of these procedures are listed below. Specific requirements for handling PFAS samples to prevent cross-contamination are detailed in the NEMP (HEPA 2020). These requirements will be complied with during sampling:

- **Sampling team:** The sampling team will follow the methodologies presented within Section 7. All field staff involved in sampling will be experienced in their respective fields and considered competent in accordance with GHD's QA system.
- **Sample collection, handling and transport**: Soil, groundwater, surface/storm water and sediment samples will be collected using new disposable nitrile gloves for each sample. Specific requirements for handling PFAS samples such as not using water-proofed clothing and having food wrappers on-airport, as per the PFAS NEMP 2.0 (HEPA, 2020) guidelines, will be adhered to. Samples will be placed into laboratory-provided Teflon-free HDPE sample jars/bottles and, once collected, will be placed on ice in insulated containers. Samples will be delivered to the laboratory within the recommended holding times for PFAS analysis.
- **Sample identification procedures:** Each sample will be labelled with the sample location, date, project identification number and sampler's initials. Sample details will be entered onto a chain of custody (CoC) form that accompanies each batch of samples to the laboratory.
- **Chain of Custody (COC) information requirements:** A CoC form will be completed and forwarded to the testing laboratory with each batch of samples.
- **Collection of QC samples:** Field QC samples will be collected as detailed in Section 8.1.2.
- **Calibration of field equipment:** Prior to use in the field, all field instruments (i.e., water quality meter) will be calibrated by the equipment supplier to optimise the accuracy of the measurements taken.

Field methods and decontamination process are discussed in Section 7.

8.1.2 Sample Analysis and Quality Control

The ASC NEPM (NEPM 2013) and the PFAS NEMP 2.0 (HEPA 2020) outline a recommended approach to QC sampling. Sampling and analysis QA/QC analytical program rationale and acceptance criteria is presented in Table 13. The QC samples to be collected during the investigation are described as follows:

Intra-laboratory (blind) duplicate: Blind duplicate samples are used to identify the variation in the analyte concentration between samples collected from the same sampling point.

Inter-laboratory (split) duplicate: Split duplicate samples provide an indication of the repeatability of the results between laboratories.

Field blanks: Field blanks are used to estimate contamination of a sample during the collection procedure. Field blanks are collected by pouring laboratory supplied deionised water into laboratory supplied bottles on-site.

Rinsate blanks: Rinsate blank samples are used to estimate the amount of contamination introduced by the re-use of sampling equipment. They are obtained by pouring laboratory supplied deionised water over decontaminated sampling equipment (e.g. hand auger) into laboratory supplied bottles.

Table 13 Sampling and Analysis QA/QC Program

Sample Type	Analysis	Rationale / Sampling Rate	Acceptance Criteria
Intra-laboratory duplicate samples	PFAS (Short Suite)	One intra-laboratory duplicate per 10 primary samples.	0 – 30% RPD
Inter-laboratory duplicate samples	PFAS (Short Suite)	One inter-laboratory duplicate per 10 primary samples.	0 – 30% RPD
Field and rinsate blanks	PFAS (Short Suite)	One sample per day for each type f media sampled.	<LOR

8.1.3 Relative Percentage Difference Calculations

Blind and split duplicate samples will be assessed by calculating the relative percentage difference (RPD) between the primary, blind and split samples in accordance with the procedure described in AS 4482.1 – 2005 (Standards Australia 2005). Calculation of RPDs provides a quantitative measure of the accuracy of the analytical results reported.

RPD results will be considered acceptable if they are less than or equal to 30% non-volatile compounds (i.e. PFAS). The only exception to this is when concentrations within the primary and blind or split sample are less than ten times the laboratory LOR. In this case, a greater RPD value is considered acceptable.

8.2 Laboratory QA/QC

8.2.1 Laboratory Analytical Programs

Laboratory methods to be used by the primary and secondary laboratories will be suitable for environmental contaminant analysis and are based on established internationally recognised procedures. Each of the laboratories is NATA accredited for the proposed analysis.

8.2.2 Laboratory Quality Control Procedures

The following laboratory QC procedures will be used during the investigation.

Laboratory duplicate samples

Laboratory duplicate sample analysis is the analysis of a laboratory derived duplicate sample from the process batch, at a rate equivalent to one in 10 samples per analytical batch, or one sample per batch if less than 10 samples are analysed in a batch. A laboratory duplicate provides data on the analytical precision and reproducibility of the analytical results.

The permitted ranges for the RPD of laboratory duplicates are dependent on the magnitude of the results in comparison to the level of reporting as shown in Table 14.

Table 14 Acceptable Laboratory RPD Ranges

Magnitude of Result	Acceptable RPD Range
<10 x LOR	No limit
10 – 20 x LOR	0 – 50%
>20 x LOR	0 – 20%

Method blank samples

Method or analysis blank sample analysis are the analysis of a sample that is as free as possible of the contaminant of potential concern (CoPC) but has been prepared the same as the samples under investigation. The analysis is to ascertain if laboratory reagents, glassware and other laboratory consumables contribute to the observed concentration of analytes in the process batch. If below the maximum acceptable method blank (20% of the practical quantitation limit), the contribution is subtracted from the gross analytical signal for each analysis before calculating the sample analyte concentration. The method blank should return analyte concentrations as 'not detected'.

Laboratory control samples

Laboratory control spike analysis is the analysis of either a reference material or a control matrix fortified with analytes representative of the analyte class. The purpose of laboratory control spike samples is to monitor method precision and accuracy independent of the sample matrix. Typically, the percentage recovery of the laboratory control spike sample is compared to the dynamic recovery limits based on the statistical analysis of the processed laboratory control spike sample analysis. Recoveries should lie between 70% and 130%.

Matrix spike samples

Matrix spike sample analysis is the analysis of one or more replicate portions of samples from the batch, after fortifying the additional portion(s) with known quantities of the analyte(s) of interest. The percentage recovery of target analyte(s) from matrix spike samples is used to determine the bias of the method in the specific sample matrix. Recoveries should lie between 70% and 130%.

Surrogate spike samples

Surrogate spike samples are samples with known additions of known amounts of compounds, which are similar to the analytes of interest in terms of extractability, recovery through clean-up procedures and response to chromatographic or other measurement. Surrogate compounds may be alkylated or halogenated analogues or structural isomers of analytes of interest. The purpose of surrogate spikes, which are added immediately before the sample extraction step, is to provide a check for every analysis that no gross processing errors have occurred, which could have led to significant analyte loss or faulty calculation. Recoveries should lie between 50% and 150%.

Internal Standards

Internal standards are known additions of known amounts of compounds which are not found in real samples, will not interfere with quantification of analytes of interest and may be separately and independently quantified. The purpose of internal standards in instrumental techniques is to provide independent signals, which serve to check the consistency of the analytical step. Internal standards are often used for organic compounds and some inorganic compounds.

9. Contingencies

Unforeseen conditions may be encountered in executing the field works required to meet the objectives of the investigation. A description of potential field sampling scenarios where contingency actions may be required is provided in Table 15 below.

Table 15 Contingency Actions

Event	Action
Proposed sampling point not available due to physical or operational constraint	GHD project team to assess DQOs related to the sample point. If acceptable, move the sample point, in consultation with MFS, to a more appropriate location. If the sample point is critical, assess whether it may be conducted during an out of hours period, or on another day or time.
Proposed sampling point is dry (groundwater and/ or surface water)	Assess DQOs related to the sample point. If acceptable, supplement the sample point, in consultation with MFS, with data from a nearby location. If the sample point is critical, assess whether it may be conducted on another day or time, after rainfall.
Perched groundwater is encountered during monitoring well installation works	Stop work, assess findings. The GHD project team should consult with a senior hydrogeologist on this matter and identify required actions to avoid cross-contamination across aquifers. The GHD project manager will advise MFS that a grab sample of groundwater should be collected and analysed for a broad range of contaminants. The borehole should be cased off, so that there is no vertical pathway for perched groundwater migration into a deeper aquifer.
Unexpected finds are encountered during the intrusive works, such as unanticipated chemicals, anthropogenic material (e.g. buried objects, drums, potential asbestos containing material (ACM), etc.)	Stop work, assess findings and discuss with MFS. Revise sampling plan to avoid area if there are environmental, health or safety risks or to adequately investigate anomalies if they are deemed to have potential consequences related to the investigation objectives.
Existing groundwater monitoring wells found to be damaged, in poor condition, silted up or in another state of disrepair.	Communicate condition to GHD project manager, who will discuss appropriate actions with MFS. Depending on the state of the monitoring well, this may involve redevelopment of the well, or potential re-installation. No action to be taken without MFS approval.
Limited access to surface water locations due to environmental, health or safety conditions	Proposed locations are indicative and have been identified based on need to inform the investigation and due consideration has been given to proposed locations being accessible. However, where access issues are encountered field staff will communicate with the GHD project manager and project director, who will discuss appropriate actions with MFS. This may involve determining an appropriate alternative sampling location, or MFS assisting with access.
Access constraints	A number of potential access and approval constraints exist for the proposed drilling locations, particularly in off-site areas. Detailed planning will be undertaken to ensure all permits and approvals, service clearance, traffic control and rig access are suitable prior to starting the field program. Where possible, alternative locations will be identified should access be restricted due to unforeseen events.

10. References

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Appendices

Appendix A

Figures

Figure 1 *Site Location Plan*

Figure 2 *Off-Site Extractive Groundwater Well Locations*

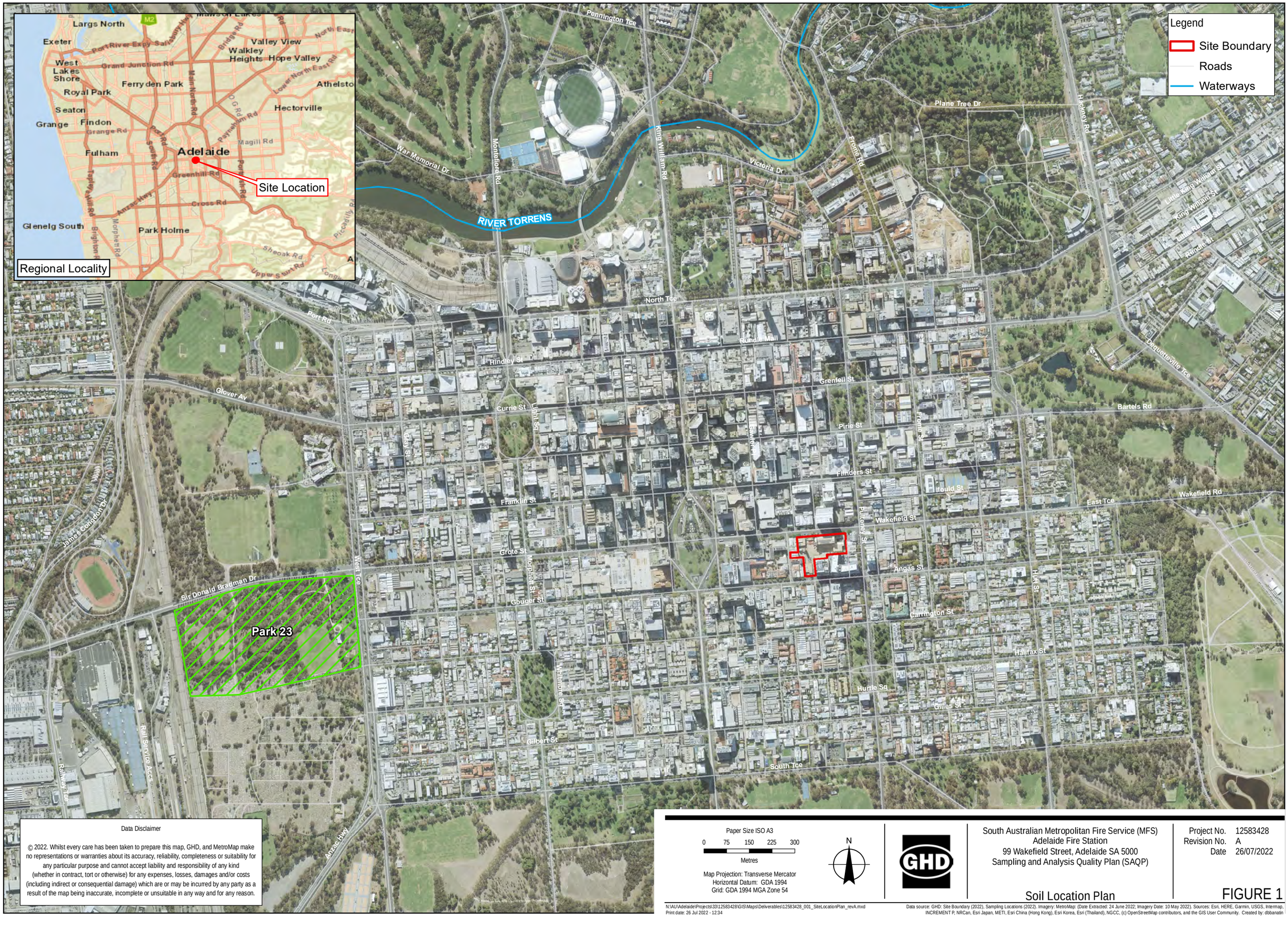
Figure 3 *Site Features and Layout Plan*

Figure 4 *Proposed Soil Bore Location Plan*

Figure 5 *Proposed On-Site Groundwater Investigation Location Plan*

Figure 6 *Proposed Off-Site Groundwater Investigation Location Plan*

Figure 7 *Proposed Sediment and Surface Water Sampling Location Plan*



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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)

Project No. 12583428
Revision No. A
Date 26/07/2022

Soil Location Plan

FIGURE 1

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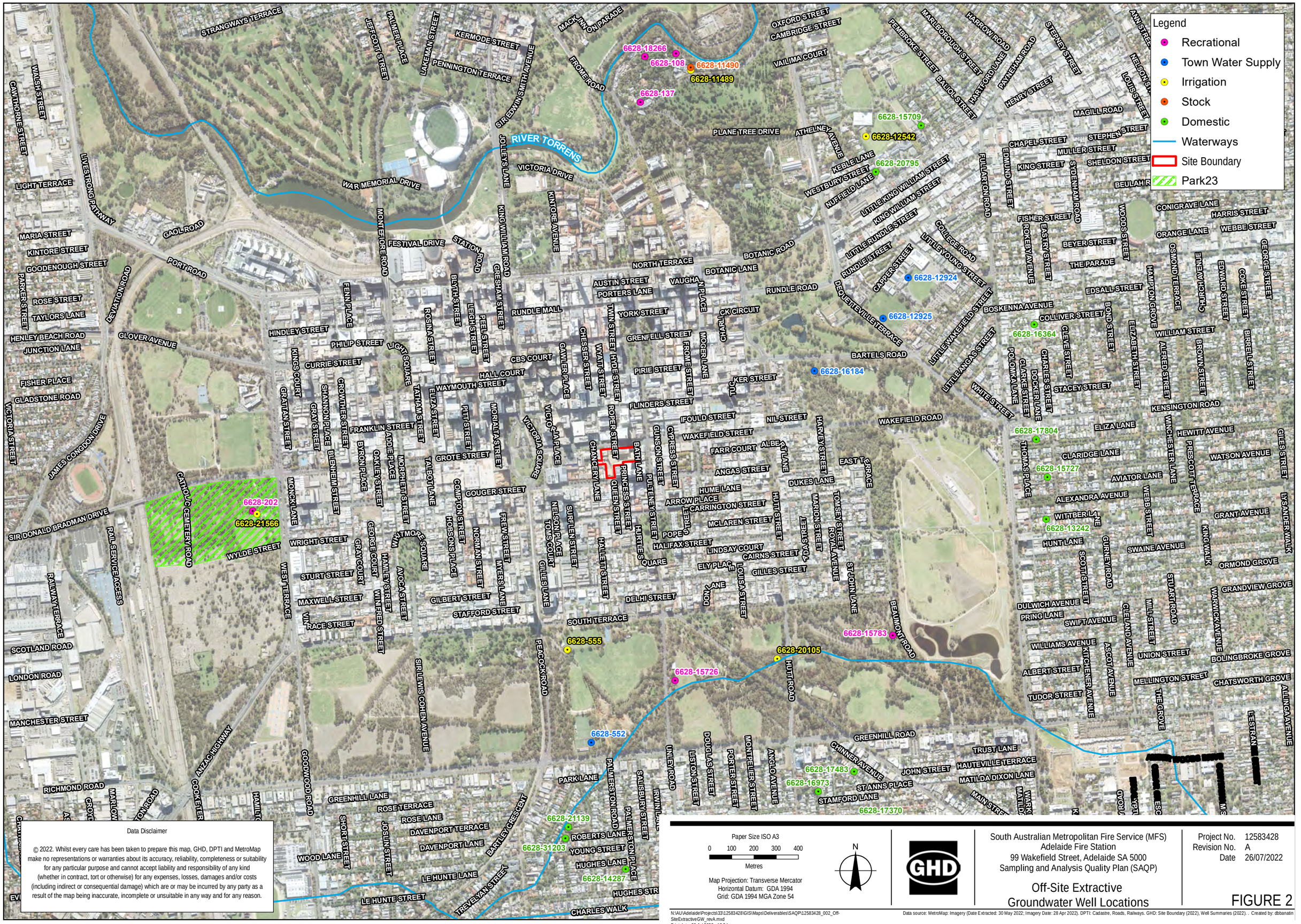
Legend
Recrational
Town Water Supply
Irrigation
Stock
Domestic
Waterways
Site Boundary
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6628-11490
6628-11489
6628-137
6628-15709
6628-12542
6628-20795
6628-12924
6628-12925
6628-16364
6628-16184
6628-17804
6628-15727
6628-13242
6628-202
6628-21566
6628-15783
6628-20105
6628-15726
6628-552
6628-555
6628-17483
6628-16973
6628-17370
6628-21139
6628-31203
6628-14287
RIVER TORRENS
STRANGWAYS TERRACE
JEFFCOTT STREET
PALMER PLACE
LAKEMAN STREET
KERMODE STREET
PENNINGTON TERRACE
MACKINNON PARADE
SIR EDWIN SMITH AVENUE
FROME ROAD
OXFORD STREET
CAMBRIDGE STREET
VAILIMA COURT
PEMBROKE STREET
MARLBOROUGH STREET
HARROW ROAD
HARTFORD LANE
PAYNEHAM ROAD
STEPNEY STREET
HENRY STREET
BALIOL STREET
LOUIS STREET
MAGILL ROAD
STEPHEN STREET
MULLER STREET
SHELDON STREET
CHAPEL STREET
KING STREET
SYDENHAM ROAD
EDMUND STREET
FULLARTON ROAD
BEULAH ROAD
CONIGRAVE LANE
HARRIS STREET
WEBBE STREET
ORANGE LANE
FISHER STREET
ROKEBY AVENUE
EASTRY STREET
BEYER STREET
WOODS STREET
THE PARADE
OSMOND TERRACE
CHURCH AVENUE
EDWARD STREET
COKE STREET
GEORGE STREET
EDSALL STREET
HAMPTON GROVE
BOSKENNA AVENUE
COLLIVER STREET
BOND STREET
ELIZABETH STREET
WILLIAM STREET
ALFRED STREET
BROWN STREET
BIRRELL STREET
KENSINGTON ROAD
CLEVE STREET
CHARLES STREET
DOCKER LANE
CLARKE STREET
POLOMKA LANE
STACEY STREET
WHITE STREET
LITTLE WAKEFIELD STREET
LITTLE ANGAS STREET
BARTELS ROAD
DEQUETTEVILLE TERRACE
LITTLE YOUNG STREET
COLLEGE ROAD
CAPPER STREET
RUNDLE STREET
LITTLE RUNDLE STREET
KING WILLIAM STREET
LITTLE KING WILLIAM STREET
WESTBURY STREET
NUFFIELD LANE
KEBLE LANE
ATHELNEY AVENUE
PLANE TREE DRIVE
VICTORIA DRIVE
JOLLEYS LANE
KINTORE AVENUE
WAR MEMORIAL DRIVE
MONTEFIORE ROAD
FESTIVAL DRIVE
STATION ROAD
KING WILLIAM ROAD
GRESHAM STREET
BOTANIC ROAD
NORTH TERRACE
BOTANIC LANE
AUSTIN STREET
VAUGHAN PLACE
PORTERS LANE
RUNDLE ROAD
RUNDLE MALL
YORK STREET
CK CIRCUIT
GRENFELL STREET
MOGER LANE
CHARLES STREET
TWIN STREET
WYATT STREET
HYDE STREET
FROME STREET
CHESSER STREET
GAWLER PLACE
PIRIE STREET
TUCK STREET
KER STREET
FLINDERS STREET
IFOULD STREET
NIL STREET
WAKEFIELD ROAD
WAKEFIELD STREET
FARR COURT
ALBERT LANE
ANGAS STREET
DUKES LANE
EAST TERRACE
HARVEY STREET
CYPRESS STREET
GUNSON STREET
PULTENEY STREET
HUME LANE
ARROW PLACE
CARRINGTON STREET
MCLAREN STREET
HUTT STREET
MARION STREET
TOMSEY STREET
ROYAL AVENUE
ST JOHN LANE
BEAUMONT ROAD
DULWICH AVENUE
PRING LANE
SWIFT AVENUE
WILLIAMS AVENUE
ALBERT STREET
TUDOR STREET
CLELAND AVENUE
MILL STREET
STUART ROAD
WARWICK AVENUE
GRANDVIEW GROVE
ORMOND GROVE
KING WALK
GRANT AVENUE
LYSANDER WALK
SCOTT STREET
GURNEY ROAD
SWAINE AVENUE
HUNT LANE
WITTBER LANE
WEBB STREET
PRESCOTT TERRACE
WATSON AVENUE
GILES STREET
HEWITT AVENUE
WINCHESTER LANE
ELIZA LANE
AVIATOR LANE
CLARIDGE LANE
ALEXANDRA AVENUE
THOMAS PLACE
HUTT ROAD
ASCOT AVENUE
KITCHENER AVENUE
UNION STREET
BOLINGBROKE GROVE
MELLINGTON STREET
CHATSWORTH GROVE
THE GROVE
LESTRAN
ALLINGA AVENUE
GREENHILL ROAD
TRUST LANE
HAUTEVILLE TERRACE
MATILDA DIXON LANE
JOHN STREET
CHINNER AVENUE
ST ANNS PLACE
STAMFORD LANE
MAIN STREET
MATILDA STREET
WARK AVENUE
ROAD
ESCOT
MS
UNLEY ROAD
LISTON STREET
DOUGLAS STREET
PORTER STREET
MONTPELLIER STREET
ANGLO AVENUE
SALISBURY STREET
IRWIN PLACE
PALMERSTON ROAD
PALMERSTON PLACE
PARK LANE
ROBERTS LANE
YOUNG STREET
HUGHES LANE
HUGHES STR
LE HUNTE LANE
LE HUNTE STREET
TREVELYAN STREET
BARTLEY CRESCENT
ROSE TERRACE
ROSE LANE
DAVENPORT TERRACE
DAVENPORT LANE
GREENHILL LANE
GOODWOOD ROAD
SHORT STREET
JOSLIN STREET
WOOD LANE
CHARLES WALK
SOUTH TERRACE
PEACOCK ROAD
SIR LEWIS COHEN AVENUE
ANZAC HIGHWAY
COOKE TER
RICHMOND ROAD
MARLOW ROAD
CROYDON ROAD
HAMILTON
DELHI STREET
GILLES STREET
LOUISA STREET
CAIRNS STREET
LINDSAY COURT
HALIFAX STREET
POPE STREET
ELY PLACE
DOCK LANE
HALLETT STREET
GILLES LANE
TOUS COURT
NELSON PLACE
SUFFLEN STREET
QUEEN STREET
PRINCESS STREET
CHANCERY LANE
BATH LANE
ROPER STREET
VICTORIA SQUARE
VICTORIA PLACE
CATHOLIC CEMETERY ROAD
WYLDE STREET
SIR DONALD BRADMAN DRIVE
JAMES CONGDON DRIVE
RAIL SERVICE ACCESS
RAILWAY TERRACE
SCOTLAND ROAD
LONDON ROAD
MANCHESTER STREET
WEST TERRACE
WRIGHT STREET
STURT STREET
MAXWELL STREET
VINE PLACE
GILBERT STREET
STAFFORD STREET
WINTERED STREET
HAMLEY STREET
GRAY COURT
GEORGE COURT
AVOCA STREET
ATMORE SQUARE
MORPHETT STREET
TALBOT LANE
COMPTON STREET
HOBSONS PLACE
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ELIZA STREET
PITT STREET
MORIALTA STREET
WAYMOUTH STREET
HALL COURT
CBS COURT
LIGHT SQUARE
ROSINA STREET
BYNG STREET
LEIGH STREET
PEEL STREET
FENN PLACE
HINDLEY STREET
PHILIP STREET
CURRIE STREET
KINGS COURT
GLOVER AVENUE
DEVIATION ROAD
PORT ROAD
GOODENOUGH STREET
KINTORE STREET
MARIA STREET
GAOL ROAD
LIVESTRONG PATHWAY
LIGHT TERRACE
GAWTHORNE STREET
WALSH STREET
PARKER STREET
ROSE STREET
TAYLORS LANE
HENLEY BEACH ROAD
JUNCTION LANE
FISHER PLACE
GLADSTONE ROAD
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Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)
Off-Site Extractive Groundwater Well Locations
Project No. 12583428
Revision No. A
Date 26/07/2022
FIGURE 2
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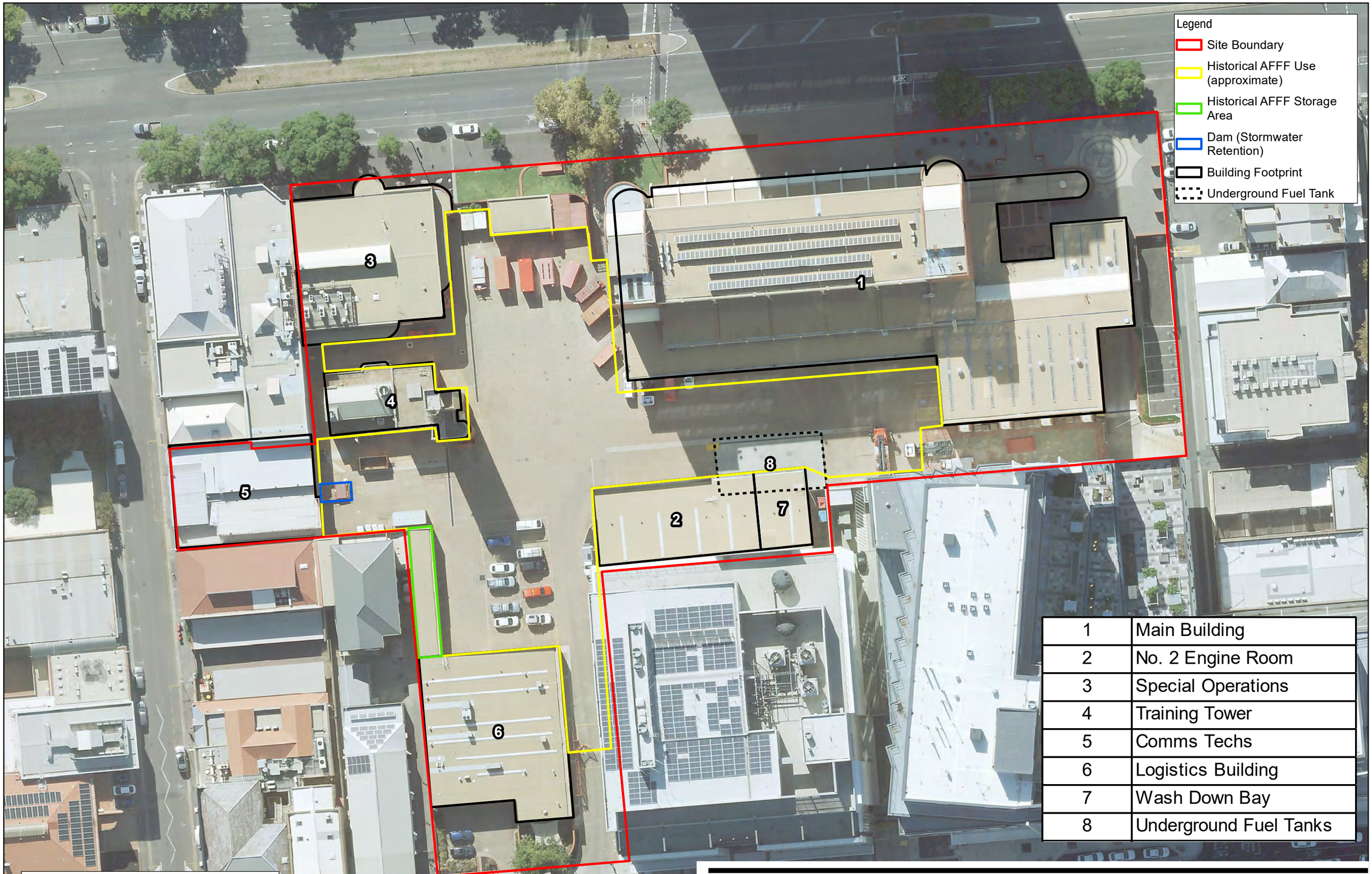

1	Main Building
2	No. 2 Engine Room
3	Special Operations
4	Training Tower
5	Comms Techs
6	Logistics Building
7	Wash Down Bay
8	Underground Fuel Tanks

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Map Projection: Transverse Mercator
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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
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Sampling and Analysis Quality Plan (SAQP)

Site Features and Layout Plan

Project No. 12583428
Revision No. A
Date 26/07/2022

FIGURE 3

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Horizontal Datum: GDA 1994
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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)

Project No. 12583428
Revision No. A
Date 26/07/2022

Proposed Soil Bore Location Plan

FIGURE 4

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)

Proposed On-Site Groundwater Investigation Location Plan

Project No. 12583428
Revision No. A
Date 26/07/2022

FIGURE 5

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South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)

Proposed Off-Site Groundwater Investigation Location Plan

Project No. 12583428
Revision No. A
Date 26/07/2022

FIGURE 6

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Metres

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Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 54

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GHD

South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)

Proposed Off-Site Groundwater Investigation Location Plan

Project No. 12583428
Revision No. A
Date 26/07/2022

FIGURE 6

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Paper Size ISO A3

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Metres

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Grid: GDA 1994 MGA Zone 54

N

GHD

South Australian Metropolitan Fire Service (MFS)
Adelaide Fire Station
99 Wakefield Street, Adelaide SA 5000
Sampling and Analysis Quality Plan (SAQP)

Proposed Sediment and **Storm** Water Location Plan (on-site)

Project No. 12583428
Revision No. A
Date 26/07/2022

FIGURE 7

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Appendix B

WaterConnect Groundwater Well Search

WaterConnect

Groundwater Data Report

Government of South Australia
Department for Environment and Water

Circle Centre -34.928668,138.604637, Radius 2km

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-1	10/07/1974	30	30	6	19/06/1974	4047	19/06/1974	Qa	UKN								
6628-2	01/11/1934	9.14	9.14			2470	19/11/1934	Qa									
6628-3		12.19	12.19	7.62	29/01/1935	956	29/01/1935	Qa	ABD	9.47	29/01/1935						
6628-4		11.58	11.58					Qa									
6628-5	12/12/1881	125.27	125.27	13.11	12/12/1881	1671	12/12/1881	N									
6628-6	01/10/1914	6.86	6.86	3.66	01/10/1949	942	01/10/1949	Qa		3.79	01/10/1949						
6628-7		6.71	6.71					Qa									
6628-8	23/06/1964	14.33	14.33	3.05	23/06/1964			Qa	ABD								
6628-9	25/06/1964	9.14	9.14	3.05	25/06/1964			Qa	ABD								
6628-10	18/09/1964	5.03	5.03	3.35	18/09/1964			Qa	ABD								
6628-11	28/03/1955	24.38	24.38			1788	22/11/1989		UKN								
6628-12	31/03/1955	12.34	12.19	6.1	31/03/1955			Qa	UKN								
6628-13	19/04/1955	30.48	30.48			1513	04/01/1992		UKN								
6628-14	28/04/1955	20.04	20.04	7.16	28/04/1955			Qa	UKN								
6628-15	04/05/1955	12.57	12.57	5.79	04/05/1955			Qa	UKN								
6628-16	11/05/1955	12.57	12.57					Qa	UKN								
6628-17	20/05/1955	12.57	12.57					Qa	UKN								
6628-18	06/05/1955	12.57	12.57	5.18	06/05/1955			Qa	UKN								
6628-19	09/06/1955	11.89	11.89	5.79	09/06/1955			Qa	UKN								
6628-20	27/06/1955	30.48	30.48			1485	27/03/1986	Qa	UKN								
6628-21	13/12/1962	18.52	18.52	5.49	13/12/1962	1021	30/01/1991	Qa									
6628-22	02/01/1963	30.48	30.48	9.14	02/01/1963				ABD								
6628-23	08/01/1963	18.29	18.29	7.8	08/01/1963	1581	03/05/1990	Qa	ABD								
6628-24	11/01/1963	18.29	18.29	7.8	11/01/1963			Qa	ABD								
6628-25	16/01/1963	18.29	18.29	7.11	16/01/1963			Qa	ABD								
6628-26	21/01/1963	18.36	18.36	7.87	21/01/1963			Qa	ABD								
6628-27	24/01/1963	18.36	18.36	7.21	24/01/1963			Qa	ABD								
6628-28	30/01/1963	18.36	18.36	6.4	30/01/1963	1010	15/07/2018	Qa	ABD								
6628-29	05/02/1963	18.36	18.36	7.11	05/02/1963			Qa	ABD								
6628-30	08/02/1963	18.36	18.36	8.38	08/02/1963			Qa	ABD								
6628-31	13/02/1963	18.29	18.29	5.79	13/02/1963			Qa	ABD								
6628-32	22/02/1963	30.48	30.48	8.18	22/02/1963				ABD								
6628-33	28/02/1963	21.31	21.31														
6628-34	18/06/1964	18.9	18.9	6.1	18/06/1964	1210	18/06/1964	Qa	ABD	0.38	18/06/1964						
6628-35	11/06/1964	36.65	36.65	4.57	11/06/1964	1100	11/06/1964	Qa	ABD	0.38	11/06/1964						
6628-36	02/06/1964	18.29	18.29	4.57	02/06/1964	1160	02/06/1964	Qa	ABD	0.63	02/06/1964						
6628-37	28/05/1964	18.29	18.29			1457	28/05/1964	Qa	ABD								

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-38	26/05/1964	18.29	18.29	4.57	26/05/1964	1671	26/05/1964	Qa	ABD								
6628-39	02/08/1966	5.79	5.79														
6628-40	02/05/1969	25.91	25.91	12.19	02/05/1969	1455	02/05/1969	Tomw(T1)	ABD	0.13	02/05/1969						
6628-41	08/05/1969	18.29	18.29	3.66	08/05/1969	1830	08/05/1969	Qa	ABD	0.25	08/05/1969						
6628-42	22/04/1969	21.49	21.49	12.19	22/04/1969	2155	22/04/1969	Qhac	ABD	0.13	22/04/1969						
6628-43	03/04/1969	25.91	25.91	12.19	03/04/1969	2966	27/10/1982	Qa Qhac	ABD	0.25	03/04/1969						
6628-44	06/03/1969	21.34	21.34	13.11	06/03/1969	2155	06/03/1969	Qhac	ABD	0.13	06/03/1969						
6628-45	26/03/1969	21.34	21.34	12.19	26/03/1969	2085	26/03/1969	Qa	ABD	0.13	26/03/1969						
6628-46	14/03/1969	27.43	27.43	13.72	14/03/1969	1255	14/03/1969	Qhac	ABD	0.25	14/03/1969						
6628-47	16/04/1969	27.43	27.43	12.19	16/04/1969	1320	16/04/1969	Tomw(T1)	ABD	0.13	16/04/1969						
6628-48	19/03/1969	15.39	15.39	5.18	19/03/1969	262	06/05/1985	Qpah	ABD	0.13	19/03/1969						
6628-49	29/05/1968	6.48	6.48						UKN								
6628-50	26/06/1957	15.24	15.24						UKN								
6628-51		8.53				2770	01/01/1951	Qpah	UKN								
6628-52	31/07/1957	7.62	7.62						UKN								
6628-53	05/08/1957	7.62	7.62	1.22	05/08/1957	357	05/08/1957	Qpah	UKN								
6628-54	02/08/1957	7.62	7.62	2.13	02/08/1957	457	02/08/1957	Qpah	UKN								
6628-55	15/07/1957	30.48	30.48	12.19	15/07/1957	2370	15/07/1957	Toc	UKN	0.13	15/07/1957						
6628-56	08/08/1957	6.1	6.1						UKN								
6628-57	07/08/1957	6.4	6.4						UKN								
6628-58	29/07/1957	7.92	7.92	1.22	29/07/1957			Qpah	UKN								
6628-59	23/07/1957	30.48	30.48	14.93	23/07/1957	1770	23/07/1957		UKN	1.26	23/07/1957						
6628-60		1.76	1.76	1.76	07/01/1969	1602	31/07/2012	Qpah									
6628-61	02/09/1970	23.77	23.77	11.28	02/09/1970			Qpah	ABD								
6628-62	04/09/1970	23.62	23.62						ABD								
6628-63	11/07/1967	11.33	11.33						ABD								
6628-64	29/05/1967	15.39	15.39						ABD								
6628-65	13/06/1967	10.97	10.97						ABD								
6628-66	08/06/1967	14.63	14.63						ABD								
6628-67	24/05/1967	14.33	14.33						ABD								
6628-68	13/07/1967	13.56	13.56						ABD								
6628-69	03/10/1967	10.22	10.22						ABD								
6628-70	13/12/1966	24	24						ABD								
6628-71	13/12/1966	30.02	30.02						UKN								
6628-72	19/06/1967	15.9	15.9						ABD								
6628-73	13/10/1971	20.42	0			2067	13/10/1971	Qpac Qpah	BKF	0.13	13/10/1971						
6628-74	18/10/1971	18.29	18.29			2909	18/10/1971	Qpac Qpah	UKN	0.13	18/10/1971	18.3					
6628-75	14/06/1974	15.15	0			1686	14/06/1974	Qpac Qpah	BKF								
6628-76	19/12/1962	4.65	4.65						UKN								

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-77	20/12/1962	5.64	5.64						UKN								
6628-78	20/12/1962	4.57	4.57						UKN								
6628-79	04/12/1964	12.19	12.19	3.66	04/12/1964			Qpah	ABD								
6628-80		29.87	29.87														
6628-81		10.97	10.97	3.35	13/05/1962			Qpah									
6628-82	01/01/1915	31.7	31.7	31.09	01/01/1915			T2									
6628-84		18.29	9.52	4.98	27/01/1967	1760	27/01/1967	Qpah									
6628-85		6.4	6.4	4.57	27/01/1967	2780	27/01/1967	Qpah		2.02	27/01/1967						
6628-86	15/06/1934	21.34	21.34	10.67	17/07/1934	2385	23/07/1934	Qpah		6.31	17/07/1934						
6628-87	06/06/1974	25.1				1688	10/06/1974	Qa	UKN			25					
6628-88	16/12/1964	12.98	12.98						UKN								
6628-89	17/12/1964	4.88	4.88						UKN								
6628-90	17/12/1964	10.06	10.06						UKN								
6628-91	29/11/1961	24.38	24.38	6.1	29/11/1961	1999	29/11/1961	Teb	UKN								
6628-94	30/09/1959	15.24	15.24	5.99	30/09/1959	1070	30/09/1959	Qa	ABD	0.63	30/09/1959	15.14					
6628-95	08/12/1966	6.71	6.71			2081	21/03/2006	Qpah	UKN			1.88					
6628-96	18/01/1967	16.69	16.69					T1	UKN								
6628-98		6.71	6.71			1257	09/10/1914	Qpah									
6628-99	01/06/1938	30.33	30.33	9.14	18/06/1938	785	18/06/1938	Qpac	BKF	3.79	18/06/1938						
6628-100		10.06	10.06			1499	10/12/1914	Qpah					N	N			
6628-101		15.24	15.24			1100	28/10/1914	Qpah									
6628-108	08/11/1967	12.8	11.58	6.4	08/11/1967	1658	21/03/2006	Qa	OPR	4.42	07/11/1967	9.96			RCL		
6628-113		60.96	60.96	3.1		1971											
6628-114	10/09/1935	28.35	28.35						OPR	0.88	10/09/1935	19.07			DRN		
6628-115	24/09/1959	25.6	25.6	10.36	24/09/1959	1928	27/10/1986										
6628-116	09/09/1959	12.19	12.19			1928	21/03/2006		ABD								
6628-117	01/09/1959	9.14	9.14	6.71	01/09/1959	1856	01/09/1959		ABD								
6628-118	03/09/1959	9.14	9.14	7.77	03/09/1959	2070	03/09/1959	Qpah	ABD								
6628-119	04/09/1959	9.14	9.14	7.62	04/09/1959	1945	12/12/2018		ABD								
6628-120	15/09/1959	9.45	9.45			1172	14/11/2002		ABD								
6628-121	06/12/1961	9.14	9.14						ABD								
6628-122	04/12/1961	24.38	24.38	5.79	04/12/1961	2241	04/12/1961	Tomw(T1)	ABD								
6628-123	23/08/1965	8.94	8.94						ABD								
6628-124	06/07/1962	15.24	15.24						ABD								
6628-125	25/08/1965	8.74	8.74						ABD								
6628-126	04/07/1962	15.24	15.24						ABD								
6628-127	26/08/1966	9.14	9.14						ABD								
6628-128																	
6628-129									NL								
6628-130																	
6628-131																	
6628-132																	

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-133																	
6628-134																	
6628-135																	
6628-136																	
6628-137	30/10/1975	16.46	16.46	7.62	31/10/1975	1005	31/10/1971	Qa	OPR	4	31/10/1975	11.58			RCL		
6628-138						1742	02/10/1914	Qa									
6628-139						1299	20/10/1914	Qa									
6628-140						1213	06/03/1914	Qa									
6628-141						1271	02/10/1944	Qa									
6628-142	22/09/1964	15.09	15.09	3.5	22/09/1964	1597	01/02/2010	Qa	ABD								
6628-143	01/01/1964	13.72	13.72			350	05/04/1976	Qpah		2.5	01/01/1976	13.72			OBS		
6628-144	01/01/1955	39.62	0						BKF	0.76	01/01/1976					282363	
6628-145	01/01/1971	22.86	22.86	7.95	21/09/1991	1245	15/01/1992	Qpah	NIU			22.86	H	N			ADE051
6628-146	01/06/1968	5.64	5.64						UKN								
6628-147	09/07/1968	6.1	6.1						UKN								
6628-148	09/07/1968	6.1	6.1						UKN								
6628-149	11/07/1968	6.2	6.2						UKN								
6628-150	13/07/1968	4.88	4.88						UKN								
6628-151	13/05/1968	7.92	7.92						UKN								
6628-152	23/08/1968	6.4	6.4						ABD								
6628-153	23/08/1968	8.53	8.53						ABD								
6628-154	23/08/1968	4.27	4.27						ABD								
6628-155	23/08/1968	6.71	6.71						ABD								
6628-156	23/08/1968	7.31	7.31						ABD								
6628-162	19/08/1947	51.21	0	9.3	19/08/1947	1385	19/08/1947	Qa	BKF	4.42	19/08/1947						
6628-201	22/02/1968	112.78	112.78	17.37	22/02/1968			Tes(T3-4)	ABD	0.25	22/02/1968						
6628-202	01/01/1972	121.92	69	17.16	14/03/1997	1496	30/01/1990	Tes(T3-4)		11.37	25/10/1972	42.67	H	H	OBS		ADE089
6628-203	10/04/1941	7.32	7.32														
6628-204	10/04/1941	9.45	9.45														
6628-205	10/04/1941	7.62	7.62														
6628-206	10/04/1941	7.01	7.01														
6628-207	10/04/1941	6.71	6.71					Qpah									
6628-208	10/04/1941	6.4	6.4														
6628-209	10/04/1941	6.4	6.4														
6628-210	10/04/1941	6.4	6.4			853	06/06/2006										
6628-211	10/04/1941	4.88	4.88														
6628-212	10/04/1941	5.18	5.18														
6628-213	10/04/1941	5.18	5.18														
6628-214	10/04/1941	4.57	4.57														
6628-215	01/01/1914	15.24	15.24														
6628-216	01/01/1941	2.41	2.41														
6628-217	01/01/1941	2.67	2.67														

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-218	01/03/1941	2.21	2.21														
6628-219	01/01/1941	1.6	1.6														
6628-220	01/05/1941	7.62	7.62														
6628-221	01/05/1941	7.62	7.62														
6628-222	01/05/1941	7.62	7.62														
6628-223	01/05/1941	7.62	7.62														
6628-224	01/01/1915	137.77	137.77	24.38	03/03/1915												
6628-225	01/03/1915	52.43	52.43	19.81	03/03/1915					1.26	03/03/1915						
6628-226	01/02/1915	30.48	30.48	3.66	03/03/1915												
6628-227	01/07/1939	23.77	23.77			2798	01/07/1939	Qpac(Q4)									
6628-228	01/03/1938	21.34	21.34	17.98	01/03/1938	3184	31/03/1938	Qpac(Q4)									
6628-229	01/05/1938	22.86	22.86	19.81	01/05/1938	2984	01/05/1938	Qpac(Q4)									
6628-230	01/01/1905	83.82	83.82	17.98	16/11/1914	1856	16/11/1914			3.16	16/11/1914						
6628-231	01/12/1970	23.01	23.01														
6628-232	01/01/1921	15.24	15.24							1.64	01/01/1921						
6628-233		17.07	17.07														
6628-234	01/11/1961	12.95	12.95														
6628-235	19/06/1914	27.43	27.43	21.34	19/06/1914	1456	19/06/1914	Tes(T3-4)		1.52	19/06/1914						
6628-236		20.88	20.88	19.51				Qpah		1.01					DRN		
6628-237		32.61	32.61												DRN		
6628-238	05/10/1972	43.5	43.5	15.8	20/10/1972	876	20/10/1972	Teb									
6628-239	19/07/1972	37.4	37.4	21.6	24/07/1972	1245	01/01/1975	Toc		0.25	24/07/1972						
6628-240		19.36	19.36	15.54				Qpah		4.55					DRN		
6628-241	24/11/1970	23.77	23.77														
6628-242	29/04/1970	14.94	14.94	1.83	29/04/1970			Qpah									
6628-243	12/04/1962	13.72	0	10.97	12/04/1962			Qpah	BKF							120282	
6628-244		21.03	21.03	19.51		882	01/06/2002	Qpah		1.01					DRN		
6628-245		22.1	22.1	19.05				Qpah		3.41					DRN		
6628-246	01/01/1936	9.14	9.14			2390	27/07/1967	Qpah							DRN		
6628-247		22.86	22.86	20.12				Qpah		3.03					DRN		
6628-248	24/03/1960	21.95	21.95												DRN		
6628-249	20/08/1965	45.72	45.72					Teb	UKN								
6628-250	25/08/1965	23.01	23.01						UKN								
6628-251	06/04/1968	24.38	24.38						UKN								
6628-252	18/03/1968	26.21	26.21						UKN								
6628-253	19/03/1968	25.5	25.5						UKN								
6628-254	21/03/1967	27.2	27.2						UKN								
6628-255	29/01/1957	12.8	12.8						UKN								
6628-257	29/01/1957	12.8	12.8						UKN								
6628-258	25/01/1957	12.8	12.8						UKN								
6628-260	24/01/1957	12.8	12.8						UKN								
6628-261	23/01/1957	12.8	12.8						UKN								

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-262	12/01/1971	15.47	15.47														
6628-263	13/01/1971	7.62	7.62														
6628-264	05/08/1954	22.86	22.86														
6628-265	07/10/1954	22.86	22.86	18.29	07/10/1954			Qpah									
6628-266	23/05/1960	25.6	25.6	17.22	23/05/1960	1230	20/05/1960	Qpah	UKN								
6628-267	12/05/1960	25.22	25.22	16.76	12/05/1960	1200	10/05/1960	Qpah	UKN								
6628-268	30/01/1963	24.92	24.92						UKN								
6628-269	03/06/1960	27.28	27.28	16.92	03/06/1960	787	01/01/1975	Qpah	UKN								
6628-270	04/02/1963	24.38	24.38						UKN								
6628-271	17/06/1960	36.58	36.58	16.92	17/06/1960	1015	16/06/1960		UKN								
6628-272	13/03/1964	27.43	27.43														
6628-274	29/01/1964	39.62	39.62														
6628-275	04/03/1964	27.74	27.74														
6628-276	17/12/1963	60.96	60.96	19.81	25/02/1964			Teb									
6628-277	13/02/1964	24.38	24.38														
6628-278	04/11/1966	24.38	24.38	16.15	04/11/1966			Qpah		0.51	04/11/1966	21.34			DRN		
6628-279	06/09/1966	24.38	24.38	17.98	06/09/1966			Qpah				19			DRN		
6628-280	25/10/1966	24.38	24.38	18.59	25/10/1966			Qpah		0.57	25/10/1966	20.73			DRN		
6628-281	13/12/1966	10.67	10.67	7.19	13/12/1966			Qpah									
6628-282	13/09/1966	24.38	24.38	17.98	13/09/1966			Qpah				18.9					
6628-283	14/02/1964	4.27	4.27														
6628-284	14/02/1964	8.53	8.53														
6628-285	17/02/1964	15.24	15.24														
6628-286	30/07/1965	9.14	9.14									9.04					
6628-287	27/10/1914	34.14	34.14	18.29	27/10/1914					1.26	27/10/1914						
6628-288	02/10/1970	45.72	45.72			1295	02/10/1970		UKN	0.25	02/10/1970						
6628-289	09/04/1964	18.29	18.29						UKN								
6628-290	03/04/1964	27.43	27.43						UKN								
6628-291	10/03/1970	36.42	36.42						WWT			29.26			DRN		
6628-292	02/04/1970	4.57	4.57						UKN			4.57					
6628-293	07/03/1970	30.18	30.18			1130	16/03/1970	Tomwa	WWT			28.35					
6628-294	16/03/1970	4.57	4.57						UKN			4.57					
6628-295	20/02/1970	24.69	24.69			2001	05/03/1970	Qpah	WWT			22.25					
6628-296	06/03/1970	4.57	4.57						UKN			4.57					
6628-297	23/02/1970	29.87	29.87			1832	11/03/1970		WWT			29.26					
6628-298	11/03/1970	4.57	4.57						UKN			4.57					
6628-300	03/10/1934	23.09	23.09			1014	06/06/2006	Qpah		0.51	03/10/1934						
6628-301	14/04/1964	27.49	27.49						UKN								
6628-302	20/04/1964	19.2	19.2	14.63	20/04/1964			Qpah	UKN								
6628-303	26/10/1970	27.43	27.43			2067	26/10/1970	Qpac(Q4)	UKN	0.13	26/10/1970						
6628-304	12/02/1969	27.74	27.74			1515	13/02/1969	Qpac(Q4)	UKN								
6628-305	28/02/1969	24.38	24.38	17.98	28/02/1969	3100	28/02/1969	Qpah	UKN	0.13	28/02/1969	24.38					

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-306	19/02/1969	27.74	27.74	17.37	19/02/1969	1515	19/02/1969	Qpac(Q4)	UKN	0.13	19/02/1969	27.74					
6628-307	17/09/1970	45.72	45.72	16.46	17/09/1970	1479	17/09/1970		UKN	0.25	17/09/1970						
6628-308	11/07/1972	25.8	25.8			1957	13/07/1972	Qpah	UKN	0.25	13/07/1972						
6628-309	23/08/1972	57	57	21	24/08/1972	1130	24/08/1972	Teb	UKN	0.63	24/08/1972						
6628-310	05/07/1972	34	34			10601	14/08/1972		UKN								
6628-311	03/08/1956	14.1	14.1						UKN								
6628-312	20/07/1956	30.48	30.48						UKN								
6628-313	12/04/1965	21.34	21.34	16.76	12/04/1965			Qpah							DRN		
6628-314	13/04/1965	9.45	9.45														
6628-315	04/05/1965	22.86	22.86	16.61	04/05/1965			Qpah		0.45	04/05/1965	18.77			DRN		
6628-316	15/04/1965	10.67	10.67												DRN		
6628-317	22/04/1965	21.34	21.34	16.76	22/04/1965			Qpah							DRN		
6628-318	31/05/1965	21.34	21.34	16.46	31/05/1965			Qpah				19.41			DRN		
6628-319	25/05/1965	23.47	23.47	16.46	25/05/1965			Qpah		0.45	25/05/1965	19.2			DRN		
6628-320	17/05/1965	21.34	21.34	16.76	17/05/1965			Qpah		0.45	17/05/1965	18.69			DRN		
6628-321	11/05/1965	22.86	22.86	16.56	11/05/1965			Qpah		0.45	11/05/1965	19.2			DRN		
6628-322	03/06/1965	6.1	6.1												DRN		
6628-323	03/06/1965	6.1	6.1												DRN		
6628-324	01/06/1965	6.1	6.1												DRN		
6628-325	02/06/1965	6.4	6.4												DRN		
6628-326	05/05/1965	4.88	4.88												DRN		
6628-327	07/05/1965	7.01	7.01												DRN		
6628-328	14/05/1965	6.1	6.1												DRN		
6628-329		18.82				171	01/01/1934	Qpah							DRN		
6628-330		21.59				4426	01/01/1935	Qpah							DRN		
6628-331	07/04/1965	21.34	21.34	16.46	07/04/1965			Qpah		0.03	07/04/1965				DRN		
6628-332	04/06/1965	6.1	6.1												DRN		
6628-333	07/06/1965	6.1	6.1												DRN		
6628-334	08/06/1965	6.1	6.1												DRN		
6628-335	08/06/1965	6.1	6.1												DRN		
6628-336	10/06/1965	6.1	6.1												DRN		
6628-337	09/06/1965	6.1	6.1												DRN		
6628-338	11/06/1965	9.4	9.4	4.88	11/06/1965			Qpah	BKF						DRN		
6628-339	15/06/1965	12.8	12.8	2.59	15/06/1965			Qpah	BKF						DRN		
6628-340	16/06/1965	0.61	0.61												DRN		
6628-341		33.53	33.53														
6628-342	08/09/1955	12.19	12.19						UKN								
6628-343	06/09/1955	12.19	12.19						UKN								
6628-344	25/05/1960	5.94	5.94														
6628-345	25/05/1960	6.1	6.1														
6628-346	24/11/1914	43.59	43.59			929	24/11/1914										
6628-347	10/10/1956	9.7	9.7						UKN								

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-348	05/10/1956	18.29	18.29						UKN								
6628-349		11.58	11.58			10839	03/11/1914	Qpah									
6628-350	09/10/1914	10.67	10.67	9.75	09/10/1914			Qpah	ABD								
6628-351	04/01/1968	28.04	28.04						UKN								
6628-352	10/01/1968	21.51	21.51						UKN			21.34					
6628-353	10/01/1968	21.49							UKN			21.49					
6628-354	18/01/1968	19.51	19.51						UKN			19.51					
6628-358																	
6628-359																	
6628-360																	
6628-363																	
6628-367	16/06/1965	12.8	12.8												DRN		
6628-368	13/09/1976	113	113	40	13/09/1976	2802	29/09/1976	Tes(T3-4)	BKF						OBS	186	
6628-369	01/01/1956	3.35	3.35						UKN								
6628-370	01/01/1956	3.66	3.66						UKN								
6628-371	01/01/1956	3.66	3.66						UKN								
6628-372	01/01/1956	3.66	3.66						UKN								
6628-373	01/01/1956	3.66	3.66						UKN								
6628-374	01/01/1956	3.66	3.66						UKN								
6628-403	11/05/1964	27.43	27.43			1100	11/05/1964	Qa	UKN								
6628-404	18/08/1964	30.02	30.02			1200	18/08/1964	Qa	UKN								
6628-405		9.75	9.75	6.71	13/12/1935	1213	13/12/1935	Qa									
6628-406		8.53	8.53			1056	15/09/1914	Qa									
6628-413						285	04/11/1949										
6628-414	18/12/1970	14.78	14.78	4.57	18/12/1970			Qpah				14.22					
6628-415	01/02/1974	19.45	19.45	10.7	01/02/1974	1508	01/02/1974	Tes(T3-4)				19.45					
6628-416	06/02/1974	12.22	12.22														
6628-417	08/02/1974	14.5	14.5						ABD								
6628-418	07/02/1974	19.9	19.9	14.35	07/02/1974	2182	07/02/1974	Qpah									
6628-419	01/01/1914	10.36	10.36			2130	16/10/1914	Qa									
6628-420	01/01/1919	40.84	40.84									21.77			DRN		
6628-421						2399	11/09/1934										
6628-423	05/12/1960	36.58	36.58					Teoc									
6628-424	09/12/1960	24.38	24.38														
6628-425	09/12/1960	10.67	10.67														
6628-426	12/12/1960	11.28	11.28														
6628-428	03/11/1965	30.63	30.63	12.95	03/11/1965	2980	03/11/1965	Qa									
6628-430	01/03/1961	24.99	24.99	11.28	01/03/1961			Qa									
6628-437	11/02/1970	15.24	15.24					Teb	UKN								
6628-438	30/01/1970	18.29	18.29						UKN								
6628-439	02/08/1966	5.79	5.79														
6628-440						1242	16/10/1939										

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-441	06/07/1964	5.33	5.33			381											
6628-442	05/06/1964	38.1	38.1			1140	05/06/1964	Tes	UKN								
6628-443	04/07/1964	12.34	12.34	6.86	03/07/1964				UKN								
6628-444	17/07/1964	18.67	18.67						UKN								
6628-445	27/05/1964	35.36	35.36			715	21/05/1964	Tes	UKN								
6628-446	18/05/1964	27.43	27.43			1430	18/05/1964	Qa	UKN								
6628-447	25/08/1964	13.41	13.41			885	25/08/1964	Qa	UKN								
6628-448	10/06/1964	19.81	19.81						UKN								
6628-449	30/07/1964	21.56	21.56						UKN								
6628-450	07/08/1964	22.25	22.25			685	07/08/1964		UKN								
6628-451	03/09/1964	24.23	24.23						UKN								
6628-452	29/01/1959	17.07	17.07	14.33	29/01/1959			Tomw(T1)	OPR	0.45	29/01/1959	12.6			DRN		
6628-453	23/06/1964	18.23	18.23						UKN								
6628-454	16/06/1964	17.07	17.07						UKN								
6628-455	26/06/1964	15.24	15.24						UKN								
6628-456	30/06/1964	15.24	15.24						UKN								
6628-457	03/12/1968	14.63	14.63					Toc									
6628-458	01/01/1968	12.8	12.8														
6628-459	20/12/1955	7.7	7.7						UKN								
6628-460	06/03/1956	20.73	20.73						UKN	0.51	06/03/1956	18.29					
6628-461	10/01/1956	8.53	8.53						UKN								
6628-462	26/01/1960	2.74	2.74						UKN								
6628-463	11/01/1960	15.24	15.24						UKN								
6628-464	26/01/1960	3.35	3.35						UKN								
6628-465	14/09/1956	10.72	10.72						UKN								
6628-466	18/09/1956	10.67	10.67						UKN								
6628-467	25/01/1960	2.59	2.59						UKN								
6628-468	19/01/1960	18.29	18.29						UKN	1.52	19/01/1960	13.97					
6628-469	27/01/1960	3.79	3.79						UKN								
6628-470	27/09/1956	15.09	15.09						UKN								
6628-471	22/01/1960	3.15	3.15						UKN								
6628-472	22/01/1960	15.24	15.24						UKN								
6628-473	29/01/1960	2.39	2.39						UKN								
6628-474	24/09/1956	15.24	15.24						UKN								
6628-475	14/10/1964	5.49	5.49									4.55					
6628-476	14/10/1964	30.48	30.48	16.76	14/10/1964												
6628-477	30/09/1964	9.14	9.14														
6628-478	18/10/1964	5.49	5.49									4.67					
6628-479	30/10/1964	60.81	60.81	15.24	30/10/1964			Tes									
6628-480	09/03/1966	9.6	9.6	7.62	09/03/1966			Qpah				9.6			DRN		
6628-481	10/03/1966	9.14	9.14	8.38	10/03/1966			Qpah				9.14			DRN		
6628-482	11/03/1966	9.45	9.45	7.92	11/03/1966			Qpah				9.45					

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-483	01/10/1964	17.2	17.2														
6628-484	17/09/1964	23.37	23.37														
6628-485	24/09/1964	20.22	20.22														
6628-486	11/10/1964	24.38	24.38														
6628-487	24/03/1966	6.71	6.71														
6628-488	28/03/1966	9.45	9.45	7.92	28/03/1966			Qpah				9.45			DRN		
6628-489	29/03/1966	10.06	10.06	8.53	29/03/1966			Qpah							DRN		
6628-490	01/04/1966	8.53	8.53	7.92	01/04/1966			Qpah							DRN		
6628-491	14/03/1966	6.71	6.71	5.18	14/03/1966			Qpah				6.71			DRN		
6628-492	31/03/1966	10.06	10.06	8.69	31/03/1966			Qpah							DRN		
6628-493	01/01/1904	40.84	40.84			1270	01/01/1939					21.03			DRN		
6628-494		18.29	18.29														
6628-495		33.53	33.53														
6628-496	19/12/1968	15.62	15.62														
6628-497	01/05/1956	15.85	15.85						UKN								
6628-498	04/05/1956	16.76	16.76						UKN								
6628-499	08/05/1956	16.76	16.76			860	14/11/2002	Qpah	UKN								
6628-500	18/03/1954	18.29	18.29						UKN	0.25	18/03/1954						
6628-501	12/04/1956	15.62	15.62						UKN								
6628-502	17/04/1956	18.29	18.29						UKN								
6628-503	19/04/1956	16.81	16.81						UKN								
6628-504	23/04/1956	16.76	16.76						UKN								
6628-505	26/04/1956	16.92	16.92						UKN								
6628-506	16/06/1965	0.61	0.61												DRN		
6628-507	05/03/1954	18.29	18.29						UKN								
6628-508	19/12/1955	3.96	3.96						UKN								
6628-509		3.66	3.66			400	06/05/1964	Qpah		0.01	01/01/1964						
6628-510		1.83	1.83			642	25/01/1956	Qpah									
6628-511	04/04/1954	20.9	20.42						UKN	1.89	04/04/1954	20.9					
6628-512	28/09/1966	9.86	9.86														
6628-513	26/08/1966	6.25	6.25	4.27	26/08/1966			Qpah									
6628-514	01/01/1912																
6628-515	07/10/1926	29.57	29.57														
6628-517	13/07/1964	9.45	9.45	7.16	13/07/1964												
6628-518	07/07/1964	9.45	9.45						ABD								
6628-519	08/07/1964	9.45	9.45	7.16	08/07/1964												
6628-520	10/07/1964	9.14	9.14														
6628-521	01/10/1969	31.24	31.24														
6628-522	01/10/1969	23.16	23.16														
6628-523	01/10/1969	31.24	31.24														
6628-524	01/10/1969	30.79	30.79														
6628-525	01/10/1969	23.62	23.62														

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-526	01/10/1969	30.94	30.94														
6628-527																	
6628-528		9.45	9.45	7.16	07/07/1964												
6628-529																	
6628-530																	
6628-531																	
6628-532																	
6628-533																	
6628-534						1351	06/12/2000										
6628-535									NL								
6628-536																	
6628-537		20.12	20.12			3198	20/09/1934	Qa									
6628-542	27/09/1974	11	11						NL								
6628-543	04/03/1976	6.7	6.7									6			DRN		
6628-544	16/03/1976	8.53	8.53									8.23			DRN		
6628-545	23/03/1976	5.18	5.18									5			DRN		
6628-546	03/04/1976	9.14	9.14									9			DRN		
6628-551	01/01/1949	141.73	141.73	17.07	01/01/1949	1671	01/01/1949	Toc(T2)	UKN	1.89	01/01/1949	71.32					
6628-552	01/09/1934	32	32	8.84	25/10/1954	800	25/10/1954		OPR	2.53	01/09/1934	18.29			TWS		
6628-553	04/08/1913	40.23	40.23	18.29	18/11/1914	742	18/11/1914										
6628-554		135	135	17.89	01/03/2022	1224	24/09/2015	Tes(T3-4)		0.83	27/03/1983	132	C	C	OBS	92469	ADE059
6628-555		29.26	29.26			1166	19/08/2001	Tomw(T1)	OPR			18.29			IRR		
6628-556		6.1	6.1	1.98	28/07/1970	736	23/03/2005	Qpah									
6628-558		9.75	9.75	7.92	21/11/1967	800	21/11/1967	Qpah									
6628-559		6.1	6.1			3385	24/01/1968	Qpah									
6628-568		4.88	4.88	3.35	03/09/1958	3242	03/09/1958	Qpah									
6628-569		3.35	3.35	1.52	01/01/1959	1699	01/01/1959	Qpah									
6628-570						4883	30/09/1914	Qpah									
6628-571		7.62	7.62			385	30/09/1914	Qpah									
6628-572		52.43	52.43	14.33	13/11/1914	757	13/11/1914	T(T1)		1.51	13/11/1914						
6628-573		6.1	0			2271	26/10/1914	Qpah	BKF								
6628-574		6.1	6.1			3570	28/08/1914	Qpah									
6628-575	22/09/1914	7.31	7.31	5.18	22/09/1914			Qpah		0.19	22/09/1914						
6628-576	09/09/1914	7.77	7.77	5.18	09/09/1914			Qpah		0.15	09/09/1914						
6628-577	01/01/1934	9.14	7.31	3.66	20/11/1967	2030	20/11/1967	Qpah									
6628-578	14/03/1914	7.31	7.31	3.35	26/03/1914	1985	26/03/1914	Qpah		0.32	26/03/1914						
6628-601	01/01/1934	30.48	0	7.62	18/10/1945	1442	18/10/1945	Qpac	BKF								
6628-602		15.24	15.24			1985	27/11/1914	Qpah									
6628-603		10.36	10.36			1514	12/01/1915	Qpah									
6628-604	01/01/1915	95.1	95.1	18.29	15/01/1915	971	15/01/1915	Toc(T2)									
6628-605	06/05/1968	27.43	0	7.05	21/11/1979	1105	18/12/1974	Qpah(Q1)	BKF	2.27	06/05/1968		H	H			ADE026
6628-606		20.73				1318		Qpah	OPR	1.51		16.46			DRN		

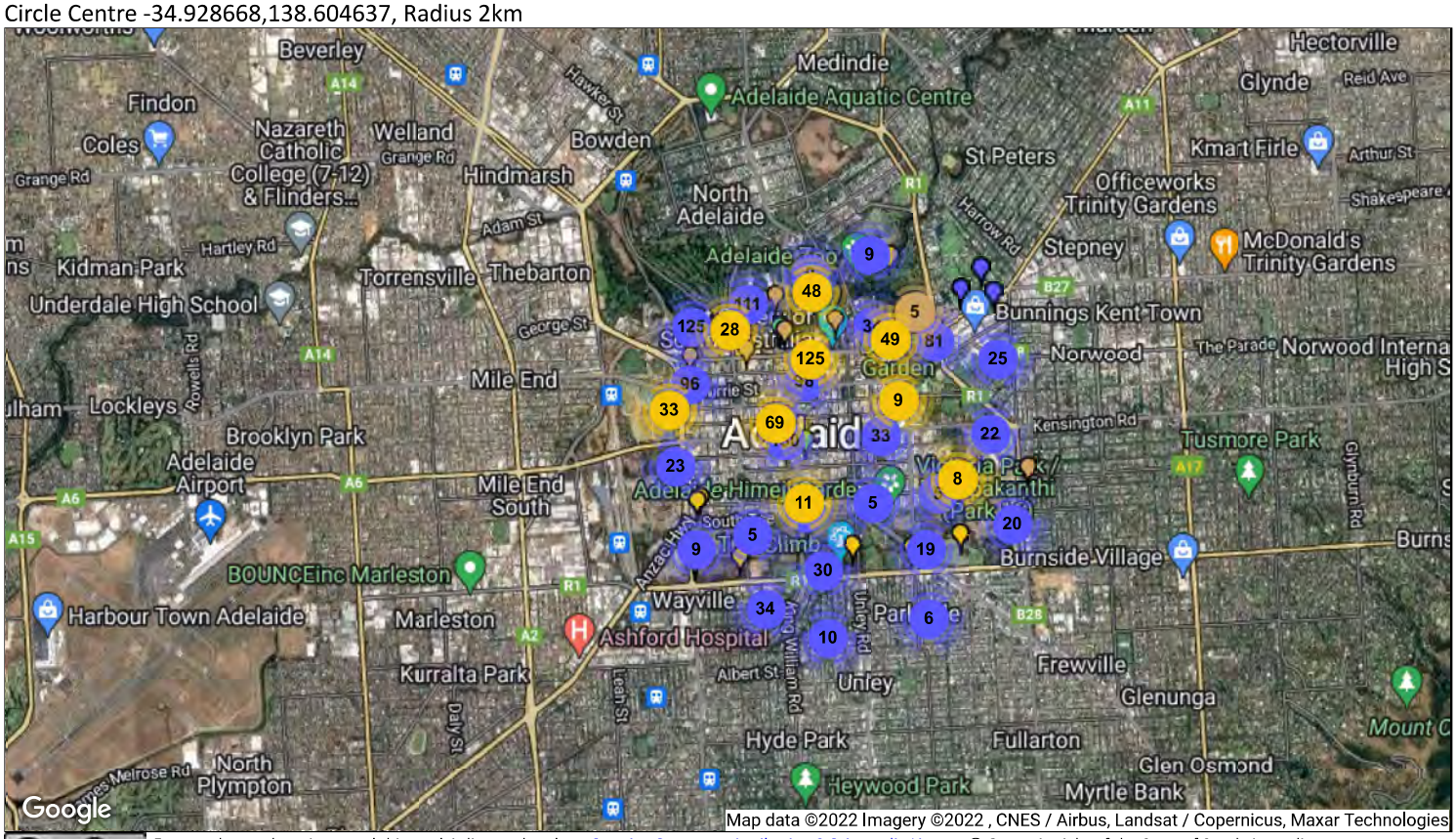
Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-607		21.03	21.03						OPR	7.58					DRN		
6628-608		22.25	22.25	17.98				Qpah									
6628-609		63.7	63.7					Teb									
6628-610		32	0					Tomwa	BKF								
6628-611		32.92	32.92						OPR						DRN		
6628-612	29/04/1970	12.57	12.57						ABD								
6628-613	01/01/1908	21.34															
6628-614		60.96	60.96					Teb	ABD						DRN		
6628-615	03/07/1963	4.57	4.57						ABD								
6628-616	30/10/1956	12.19	12.19						UKN								
6628-617	30/10/1956	12.19	12.19						UKN								
6628-618	27/11/1956	15.44	15.44						UKN								
6628-619	08/11/1956	12.19	12.19						UKN								
6628-620	09/11/1956	12.19	12.19						UKN								
6628-621	09/11/1956	12.19	12.19						UKN								
6628-622	19/11/1956	15.34	15.34						UKN								
6628-624	30/10/1956	12.19	12.19						UKN								
6628-625	17/10/1973	19.6	19.6	16.2	17/10/1973	1295	17/10/1973	Qpah	ABD	0.13	17/10/1973						
6628-626	24/10/1973	30.6	30.6	16.2	24/10/1973	2309	24/10/1973	Tomwr	ABD	0.13	24/10/1973						
6628-627	13/03/1959	12.19	12.19						UKN								
6628-629	23/03/1959	20.12	20.12						UKN			17.07					
6628-630	15/08/1972	59	59	21.5	29/09/1972	1356	29/09/1972	Teb	UKN	0.63	29/09/1972						
6628-631	29/08/1972	30.25	30.25	15.9	18/09/1972	2253	18/09/1972		UKN								
6628-632	20/09/1972	30.4	30.4						UKN								
6628-633		42.67	42.67			1157	01/01/1962	Qpah									
6628-634						1160	01/01/1962										
6628-635		22.9		13.7	25/06/1975	5118	25/07/1975	Qpah		0.06	25/06/1975						
6628-636						4869	13/11/1914	Qpah									
6628-637		10.36	10.36			5155	16/10/1914	Qpah									
6628-638		10.06	10.06			3584	20/10/1914	Qpah									
6628-639	27/09/1963	6.55	6.55						ABD								
6628-640	22/10/1962	26.52	26.52	11.43	18/01/1963	8482	22/10/1962	Qpah	OPR	0.3	18/01/1963	26.52			DRN		
6628-641		22.86	22.86	12.19	08/06/1939	1656	08/06/1939		OPR						DRN		
6628-642		26.12	26.12						ABD						DRN		
6628-643	19/09/1914	31.85	31.85	18.29	09/10/1914	1485	19/09/1914	Tomwa		0.63	09/10/1914						
6628-644	12/11/1963	30.17	30.17	3.35	12/11/1963			Qpac									
6628-645	20/11/1963	18.29	18.29														
6628-646	22/11/1963	18.29	18.29														
6628-647		18.59	0			1685	06/11/1914	Qpah	BKF								
6628-648		8.23	8.23														
6628-649	11/09/1964	9.35	0						BKF								
6628-650	14/09/1964	9.35	0						BKF								

Unit No	Date	Max Depth (m)	Latest Depth (m)	SWL (m)	SWL Date	TDS (mg/L)	TDS Date	Aquifer	Status	Yield (L/sec)	Yield Date	Cased To (m)	SWL Status	Salinity Status	Purpose	Permit No	Obs No
6628-651	22/12/1965	12.27	12.27						ABD								
6628-652	30/12/1965	12.65	12.65						ABD								
6628-653		7.62	7.62	7.01	06/11/1956	1413	06/11/1956	Qpah		0.04	01/01/1965						
6628-654		18.9	0	8.53	17/10/1934	1128	17/10/1934	Qpah	BKF								

500 records

Government of South Australia WaterConnect

Circle Centre -34.928668,138.604637, Radius 2km



Appendix C

Site Inspection Photographs

Site Inspection Photographs – 2 June 2022

Photo 1 *'Foam pod', ready for loading to rear of MFS vehicle, stored in the 'No 2. Engine Room', central-southern portion of site*

Photo 2 *View across central portion of site, paved ground surface, looking east*

Photo 3 *View across central-southern portion of site, looking south towards the 'Logistics Building'*

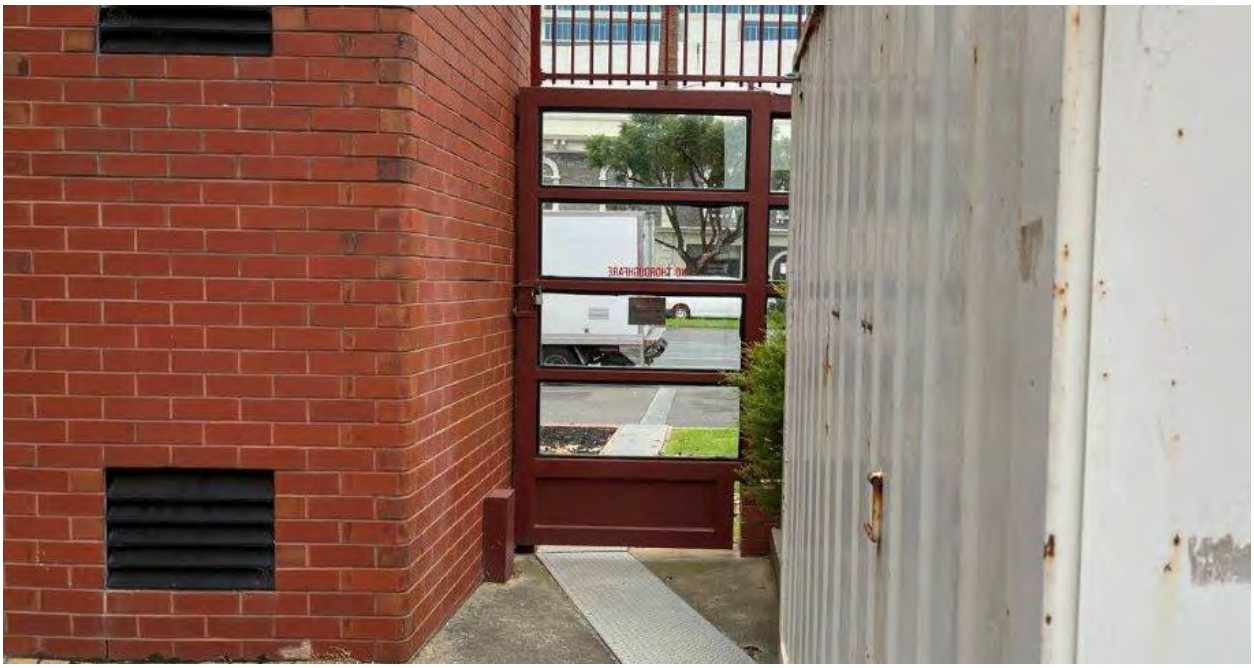


Photo 4 *Location of site surface water (stormwater) discharge point to Wakefield Street, looking north*

Photo 5 *Historical AFFF storage area, south-western portion of the site, looking south*

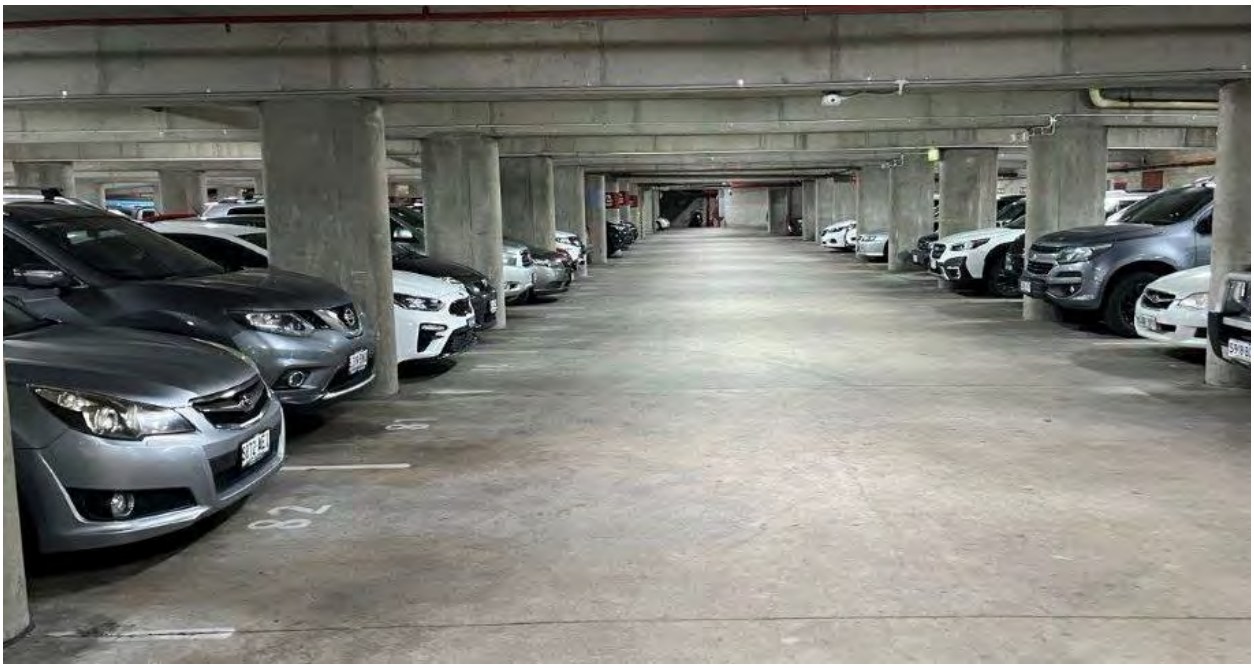


Photo 6 *Basement carpark located under the Main Building, looking east*

Photo 7 *Stormwater collection pit, central within basement carpark, Main Building*

Photo 8 *Current (2022) foam storage, held within the 'No. 2 Engine Room' on pallets'*

Photo 9 *Fuel bowsers above underground storage tanks, located to the north of the 'No. 2 Engine Room''*

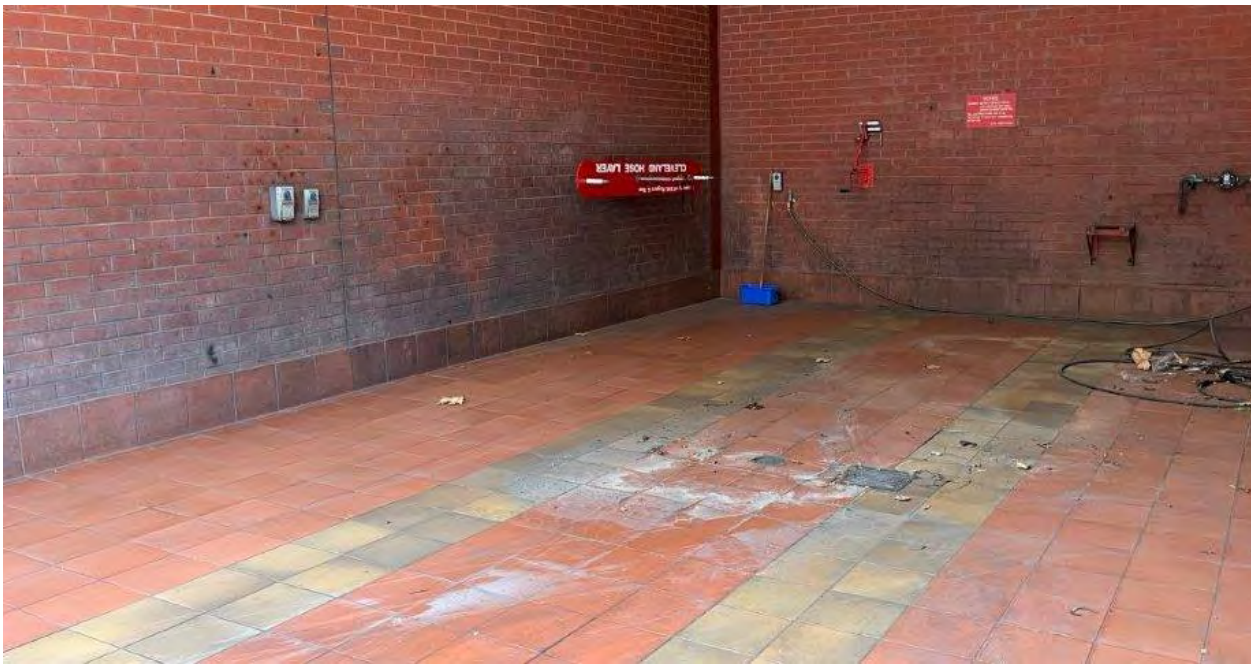


Photo 10 *Interior view of the wash down bay, eastern end of the 'No. 2 Engine Room', looking south-east*

Photo 11 *View across concrete hardstand area at the eastern end of the site, south of the Main Building, looking east*

Photo 12 *Interior of room within the 'Special Operations' building, north-western portion of site*

Photo 13 ***Small quantities of paints and solvents stored in sealed containers on shelving units within the 'Comms Techs' building at the western end of the site.***

Appendix D

Adelaide Fire Station – AFFF Historical Use Questionnaire

MFS Station – AFFF Historical Use Questionnaire

Please distribute the following questionnaire to nominated MFS personnel who have worked at MFS sites when active use of AFFF ***(aqueous film-forming foam, firefighting foam)*** occurred before it was phased out in 2016. When applicable, please annotate key site features on the site plans attached at the end of this questionnaire.

MFS Station: Adelaide SAMFS Fire Station

Name: A shift Officers

Position when working at the site: Firefighters and Officers

Phone number: **Email:**

Date of response: 06/30/22

Item	Question	Response
1	*When did you start working at this station?*	Mid 1980s to 1990
2	*How long have you worked at this station?*	30-35 years
3	*Can you describe where stormwater from the site is usually discharged to (e.g. stormwater pit, nearby creek / pond, street gutter)?*	Wakefield Street and Chancery Lane
4	*Can you describe any changes in how stormwater has been managed at the site over time?*	None
5	*Is stormwater harvested within the site?*	It was diverted to a dam that then overflowed to th
5.1	*If yes, please describe where and how stormwater is harvested.*	Not any more.
5.2	*For what purposes is stormwater harvested?*	It was stored in a dam to be used for training purposes
6	*Are there groundwater wells / bores at the site?*	No
6.1	*If yes, for what purpose is groundwater used at the site?*	

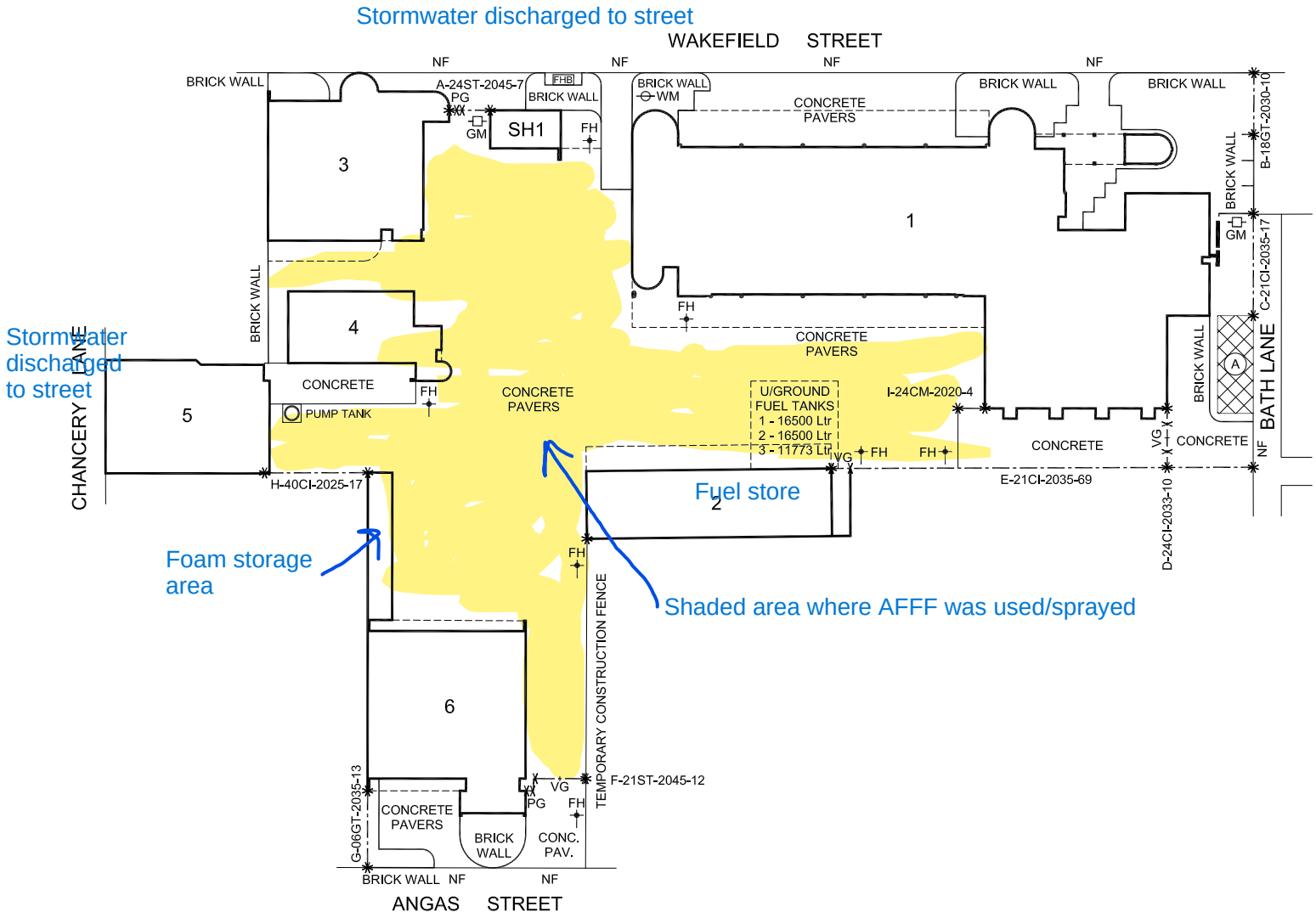
Item	Question	Response
6.2	*Where are the groundwater well / bores located on site? Please mark the location on the attached site plan.*	
7	*Date when AFFF was first used on site?*	Since the opening of the station, and at the previous station on this site
8	*Can you provide the product names of any AFFF used on the site? (e.g. Ansulite, 3M Light Water)*	3M
9	*Was AFFF used in regular training exercises?* *If so:*	Yes
9.1	*How often was the training?* *(e.g. weekly, monthly, quarterly)*	Weekly
9.2	*Can you describe the location of the training areas and annotate them on the site plan?*	The entire rear yard
9.3	*Can provide an estimate of how much AFFF was used in each training?*	No
9.4	*Was the training ground sealed / open?*	Paved
9.5	*Was AFFF dispersed aerially?* *If so, please indicate the maximum extent on the site plan?*	Yes, most likely over the whole rear yard
9.6	*When was the date of the last training event that included the use of AFFF?*	Probably around 2016
10	*Please describe how the waste water was managed following training events?* *Specifically, was there a recycling system, storage pond, storage tanks or drains?* *Please annotate waste water discharge point / pathways on the site plan.*	Run off as stormwater
11	*Did any waste water flow into drains that directed the waste water off-site?* *Please annotate the waste water discharge points / pathways on the site plan.*	Yes
12	*Were there any changes how the waste water was managed over time?* *If so, please describe the changes.*	The dam was closed some time ago, but otherwise we know of no changes
13	*Is there any inventory of AFFF use for the site?*	Not that we are aware of.

Item	Question	Response
14	*Can you estimate the total volume of AFFF used on site before it was phased out in 2016?*	No
15	*Where was AFFF stored on site?* *Please annotate the storage location on the site plan.*	Foam store
15.1	*What type and size of storage containers were used to store AFFF on site?*	20 litre drums, 200 litre drums, 1000 litre IBC
15.2	*What is the number of storage containers or the total volume of AFFF that was typically stored on site at any given time prior to 2016?*	Probably around 5000 litres
16	*Please describe where and how AFFF was transferred from storage containers to the fire trucks / fire-fighting appliances.* *What equipment was used to transfer the AFFF?*	Decanted by hose
17	*How were spent drums of AFFF disposed of?*	Rubbish
18	*Were there any wash down areas for fire trucks, equipment or AFFF containers?* *If so:*	Yes
18.1	*How was the waste water from such areas managed? (e.g. recycling, treatment, storage pond or discharge to drains)*	Sump
18.2	*Were there any changes how the waste water was managed over?* *If so, please describe the changes.*	No
19	*Please describe / annotate the specific location(s) of any other chemical storage facilities (including fuel and oil) and describe the type and typical use of those chemicals.*	Fuel store, fuel pod, vehicle refilling in western shed
20	*Is there an incident log / register for the site?*	Yes

Item	Question	Response
21	*Are you aware of any AFFF (or other chemical) releases that may have occurred outside of typical application scenarios? If so:*	No
21.1	*When did such release(s) happen?*	
21.2	*What substance(s) was/were released?*	
21.3	*Where did such release(s) happen?* *Please annotate the release point(s) on the site plan.*	
21.4	*Where was the released AFFF or chemical discharged to?* *Please annotate the discharge point(s) on the site plan.*	
22	*Are there areas of the site where training activities and / or AFFF release(s) have historically occurred that are now unused or have been built on?*	Maybe training areas of the old station.
23	*Have there been any significant bulk earthworks on the Station site that resulted in soil being relocated from one area to another?*	Maybe during construction of the station.
24	*Please describe any changes to the Station that you are aware of with respect to the storage and use of AFFF.*	It's discontinued use.

Any other comments or notes.

Scale Bar Units in Metres (1:750) Plot at scale of 1=0.75 All dimensions to be verified on site



NORTH

BUILDINGS

1	MAIN BUILDING
2	NO. 2 ENGINE ROOM
3	SPECIAL OPERATIONS
4	TRAINING TOWER
5	COMMS TECHS
6	LOGISTICS BUILDING
SH1	GARAGE STORE

PAVING DETAILS: Location, Type, Fail year, Area (sq ms)	
A bitumen 2015 93	
FENCES *code-height-type-fail date-length (ms)*	
CI corrugated iron	PW post and wire
CM chain mesh	WM weld mesh
GT galtube	NF not fenced
PG pedestrian gate	VG vehicle gate
WM *Water Meter*	*Fence junction*
GM *Gas Meter*	PMT *Pad mtd trans*

ADELAIDE - SAMFS METRO. FIRE STATION 99 WAKEFIELD STREET ADELAIDE 5000

Government of South Australia
Department for Transport, Energy and Infrastructure

Asset no.	*07713*	Client.	*SAMFS*
DTEI Office.	*ADELAIDE*	Sheet.	*1 of 1*
Created by.	*Survcad*	*R.L.Chapman*	*Feb 2010*
Modified by.	*Archink*	*G lloyd*	*Sep 2018*
Audited by.	-	-	-
Title details.	*refer layer " site-allotment "*		
Site area.	*1.3601 ha*	Accuracy.	*Site Survey*

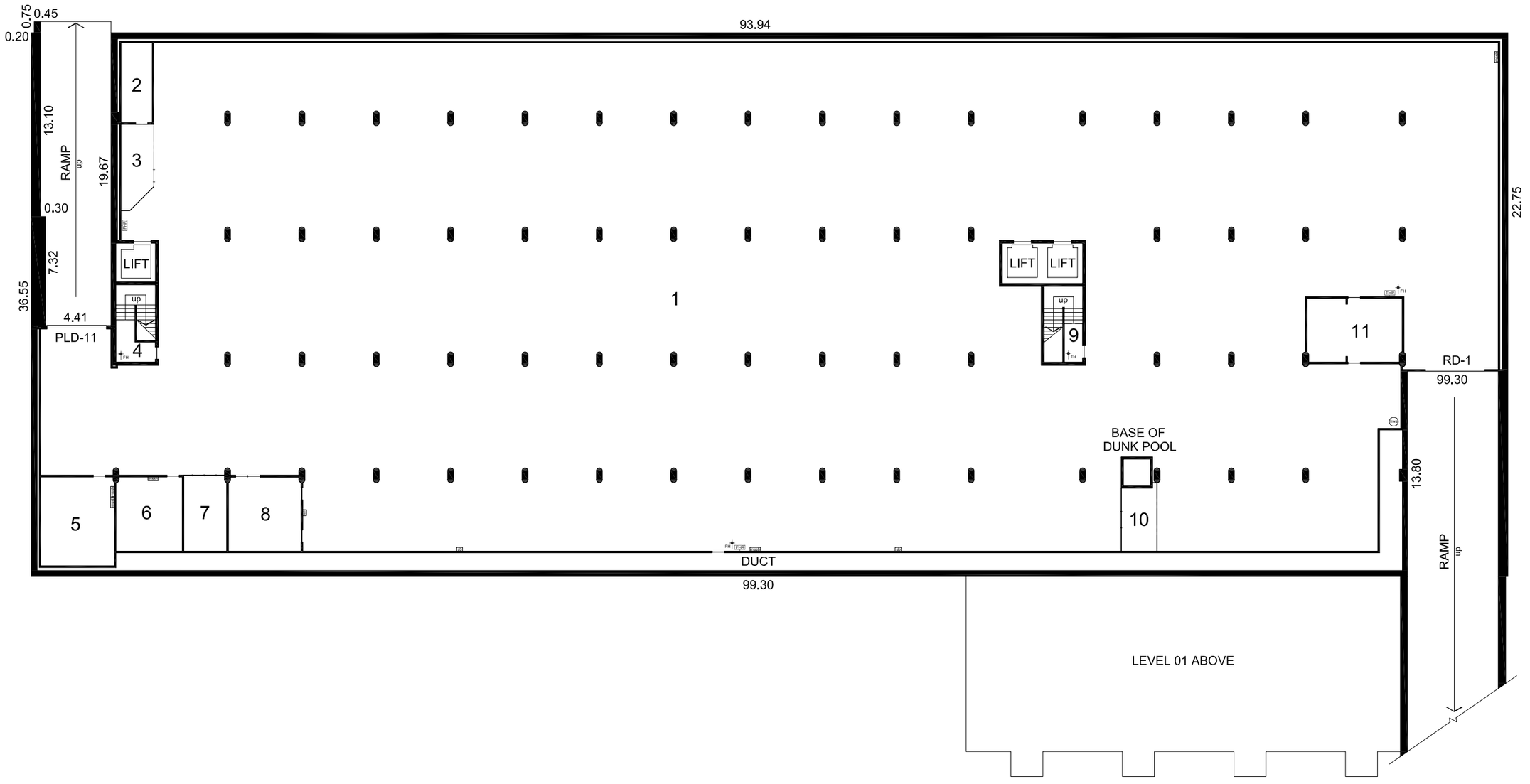
Strategic Asset Management Information System Plan

SAMIS 07713

1 10 20 30 40 50 60 70 80 90 100 110

Scale Bar Units in Metres (A3 1:300) Plot at a scale of 1=0.3 All dimensions to be verified on site

NORTH



LEGEND
PLD = Panel Lift Door
RD = Roller Door

Asset Name **ADELAIDE METROPOLITAN FIRE STATION**

Building Use **MAIN BUILDING - BASEMENT**

Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*
Modified by.	*Archink*	Drawn	*A Bentley*	Date	*Mar 2010*
Bldg area m²	*3431*	Ver area m²	-	Plan ref.	-

Government of South Australia
Department for Transport, Energy and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 07713-01-1

Scale Bar Units in Metres (A3 1:250) Plot at a scale of 1=0.25 All dimensions to be verified on site

1 10 20 30 40 50 60 70 80 90

NORTH

94.05 ALL

R=3.74

238

237

239

2.24 ALL

LEVEL 01 BELOW & O3 ABOVE

50.62 ALL

PLD-5 PLD-4 PLD-3 PLD-2 PLD-1

R=3.74

209 208

2.54 ALL

2.84 ALL

206 205 207

2.32

4.76

14.57

VERANDAH

5.35 ALL

253

R=2.38

4.91 ALL

232 231 204 202 201

B/IN

9.81

PERGOLA

LEVEL 01 BELOW

7.17 ALL

203

0.28

13.75

22.82

30.31 ALL

LIFT

242

240

241

236

POLE

233

POLE

POLE

234 212

LIFT LIFT

214

213

215

210

235

216

217

218

219 220

6.00

3.91

1.22

2.17

VER

10.88

10.40

211

1.21

1.04

LEVEL 01 BELOW

243 244 245

246

248

247

1.00

2.42

4.74

R=2.52

PLD-6 PLD-7 PLD-8 PLD-9 PLD-10

5.54 ALL

0.30

39.60 ALL

0.28

4.86 ALL

230

SPA

227

225

228

229

DUNK

226

223

DUCT

221

8.50

50.55 ALL

8.60

224

5.34

6.91.

VERANDAH

57.45

LEVEL 01 BELOW

LEVEL 01 BELOW

222

18.28 ALL

15.10

3.01 1.68 249 1.68 2.15 5.35 1.68 250 1.68 2.15 5.35 1.68 251 1.68 2.15 5.35 1.68 252 1.68 2.01 2.15

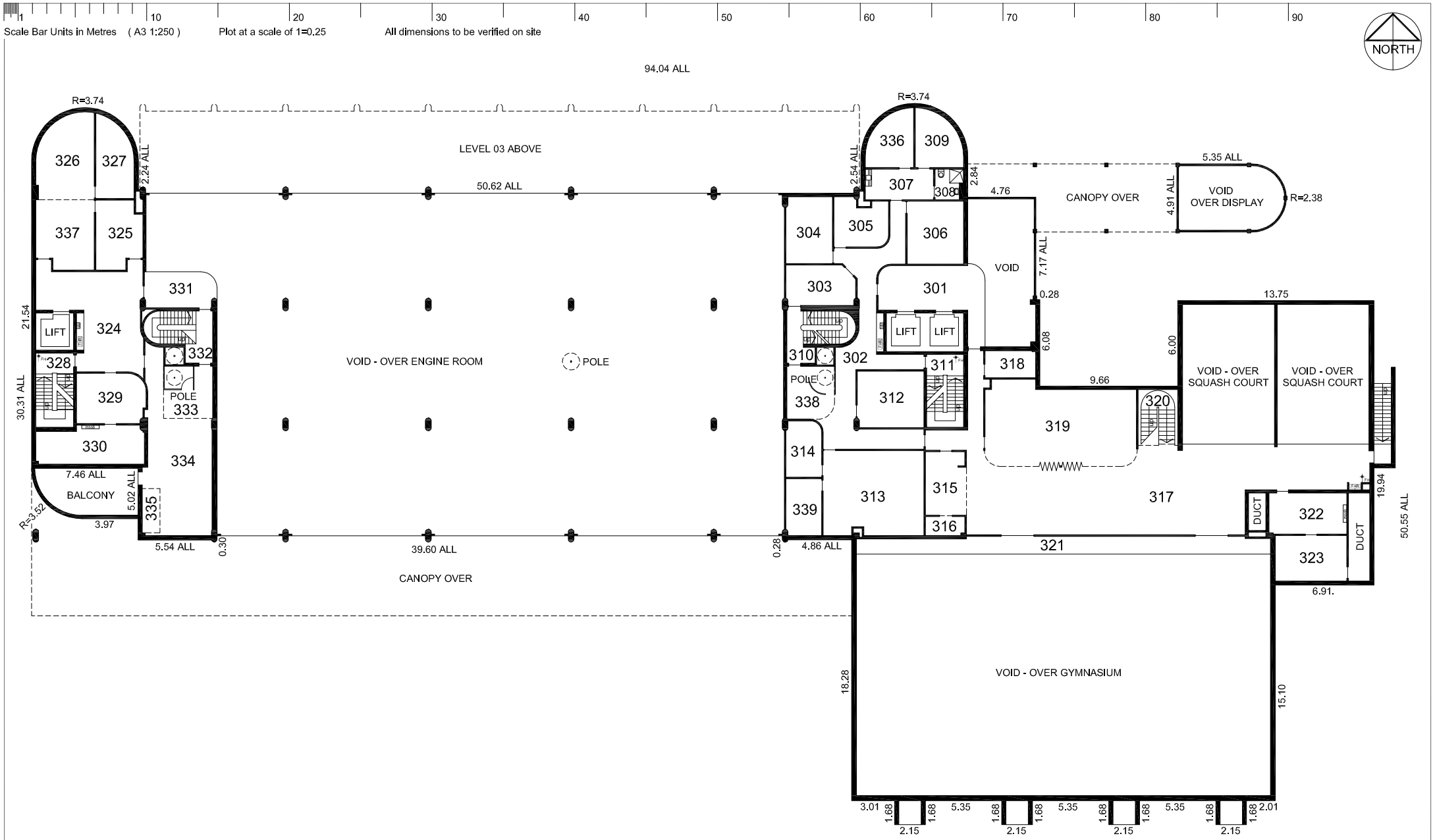
LEGEND
PLD = Panel Lift Door
RD = Roller Door

Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**				
Building Use	**MAIN BUILDING - GROUND FLOOR**				
Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*
Modified by.	*Archink*	Drawn	*C Kneebone*	Date	*Mar 2010*
Bldg area m²	*2673*	Ver area m²	*399*	Plan ref.	-

Government of South Australia
Department for Transport, Energy and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 07713-01-2



Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**						
Building Use	**MAIN BUILDING - FIRST FLOOR**						
Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*		
Modified by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Jan 2019*		
Bldg area m²	*2660*	Ver area m²	*21*	Plan ref.	-		

Government of South Australia
Department of Planning, Transport and Infrastructure

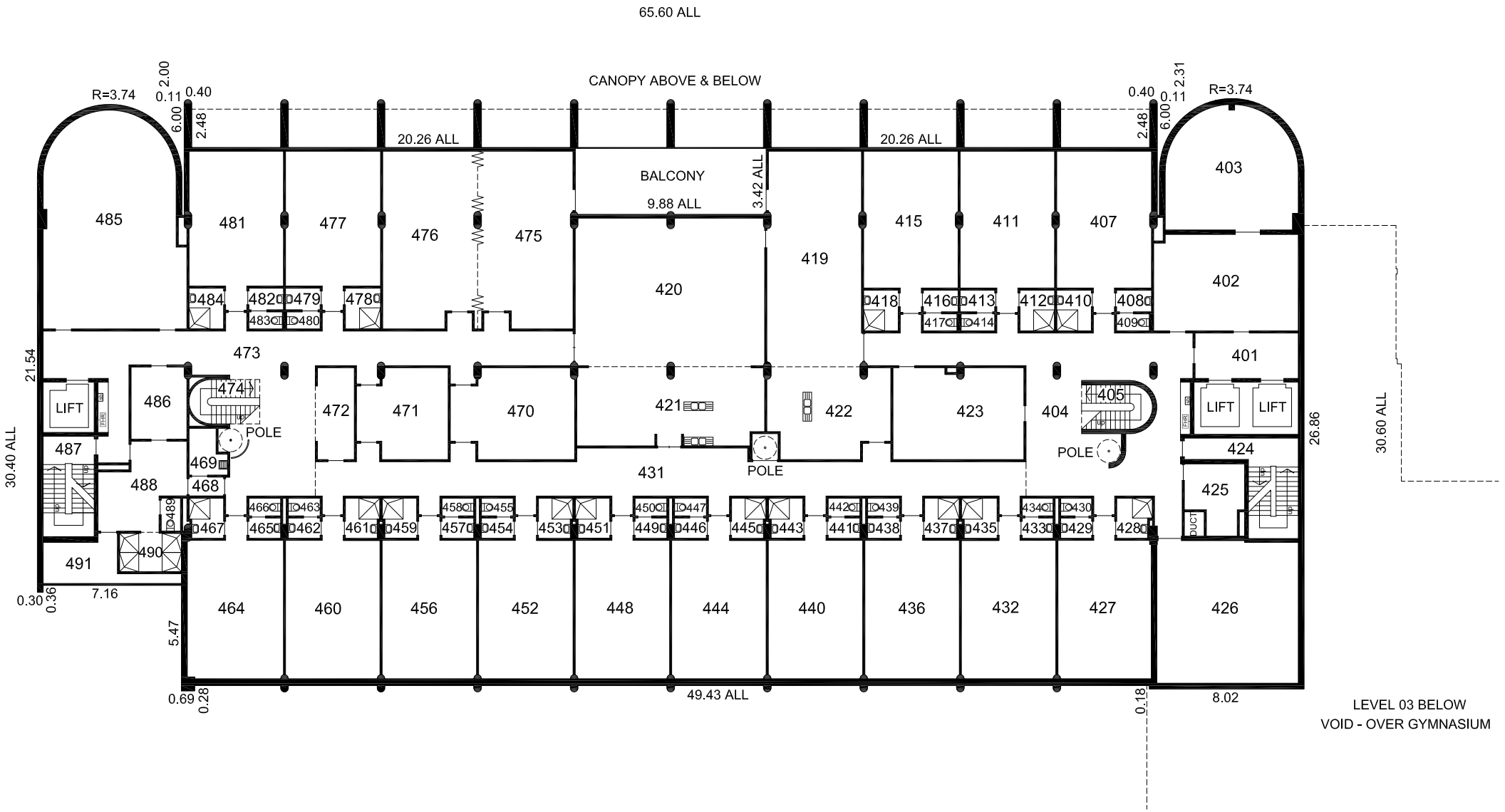
Strategic Asset Management Information System Plan

SAMIS 07713-01-3

Scale Bar Units in Metres (A3 1:200) Plot at a scale of 1=0.2 All dimensions to be verified on site

1 10 20 30 40 50 60 70

NORTH



Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**						
Building Use	**MAIN BUILDING - SECOND FLOOR**						
Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*		
Modified by.	*Archink*	Drawn	*R Arboit*	Date	*Jan 2019*		
Bldg area m²	*1792*	Ver area m²	*34*	Plan ref.	-		

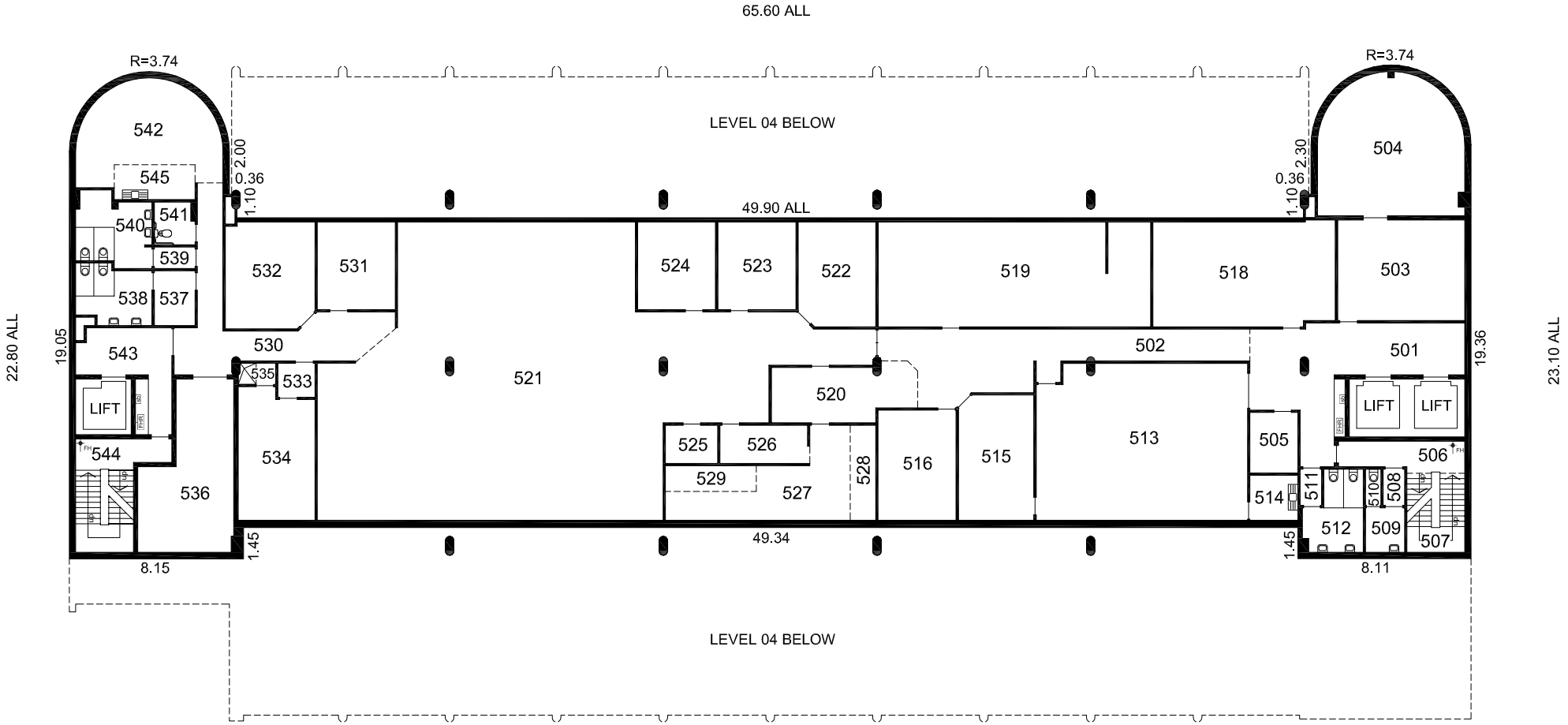
Government of South Australia
Department of Planning, Transport and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 07713-01-4

Scale Bar Units in Metres (A3 1:200) Plot at a scale of 1=0.2 All dimensions to be verified on site

NORTH



Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**						
Building Use	**MAIN BUILDING - THIRD FLOOR**						
Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*		
Modified by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Sep 2017*		
Bldg area m²	*1069*	Ver area m²	-	Plan ref.	-		

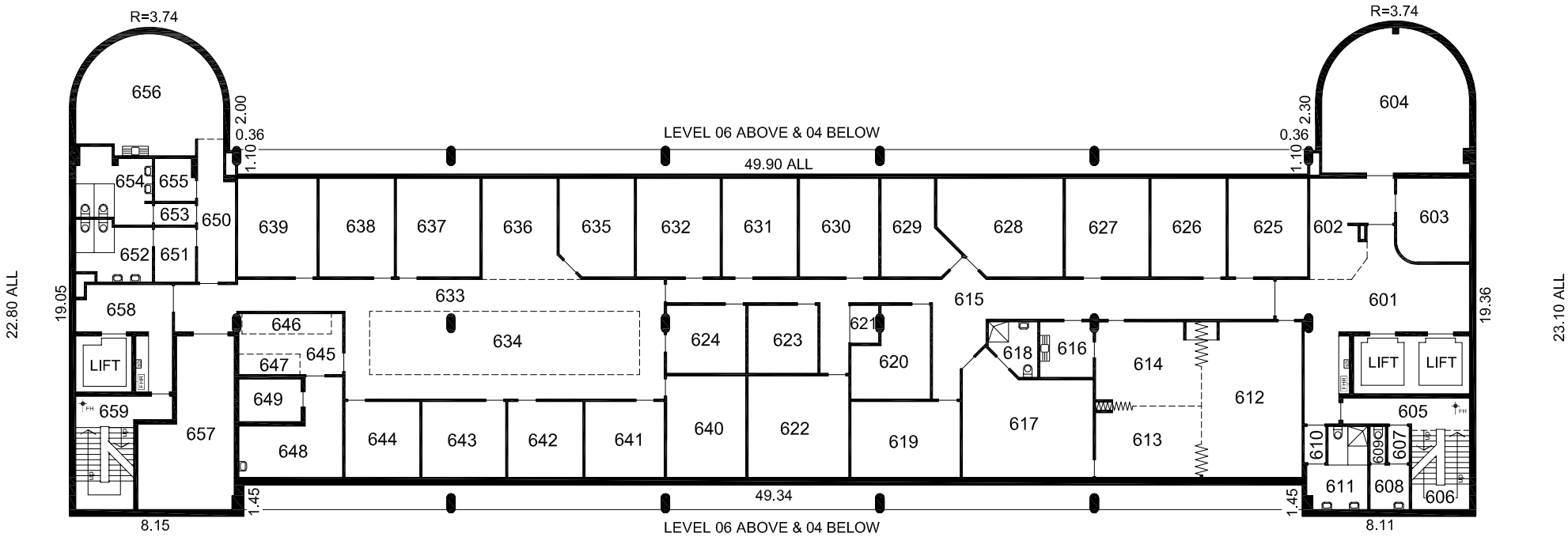
Government of South Australia
Department of Planning, Transport and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 07713-01-5

Scale Bar Units in Metres (A3 1:200) Plot at a scale of 1=0.2 All dimensions to be verified on site

NORTH



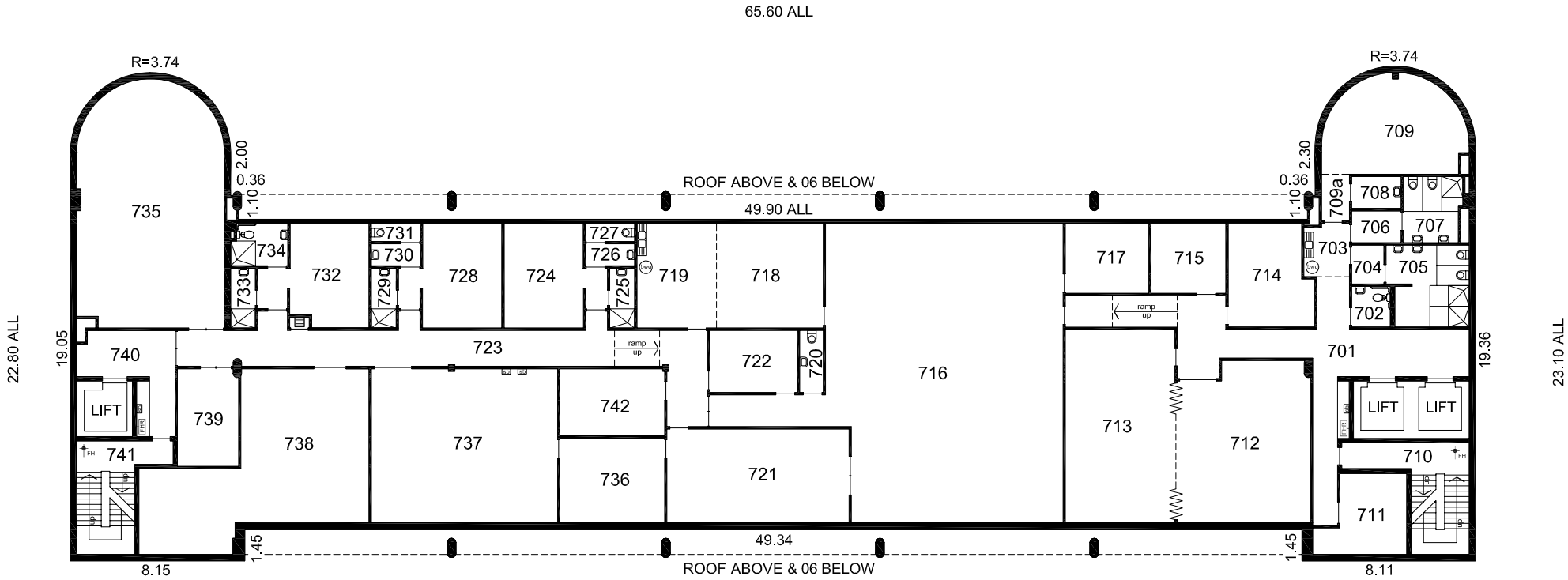
Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**						
Building Use	**MAIN BUILDING - FOURTH FLOOR**						
Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*		
Modified by.	*Archink*	Drawn	*A Bentley*	Date	*Mar 2010*		
Bldg area m²	*1069*	Ver area m²	-	Plan ref.	-		

Government of South Australia
Department for Transport, Energy and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 07713-01-6

Scale Bar Units in Metres (A3 1:200) Plot at a scale of 1=0.2 All dimensions to be verified on site



Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**						
Building Use	**MAIN BUILDING - FIFTH FLOOR**						
Created by.	*Survcad*	Drawn	*R.L.Chapman*	Date	*Feb 2010*		
Modified by.	*Archink*	Drawn	*A Bentley*	Date	*Mar 2010*		
Bldg area m²	*1069*	Ver area m²	-	Plan ref.	-		

Government of South Australia
Department for Transport, Energy and Infrastructure

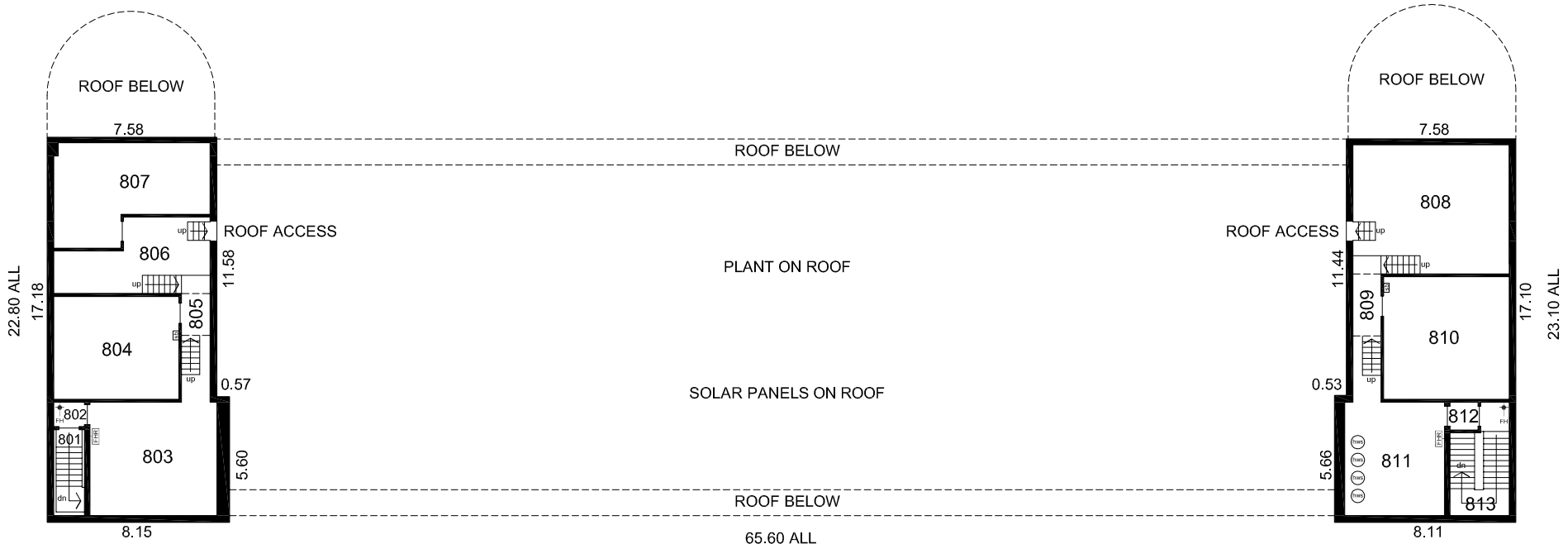
Strategic Asset Management Information System Plan

SAMIS 07713-01-7

1 10 20 30 40 50 60 70

Scale Bar Units in Metres (A3 1:200) Plot at a scale of 1=0.2 All dimensions to be verified on site

NORTH



Asset Name	**ADELAIDE METROPOLITAN FIRE STATION**				
Building Use	**MAIN BUILDING - SIXTH FLOOR**				
Created by.	*Archink*	Drawn	*A Bentley*	Date	*Mar 2010*
Modified by.	-	Drawn	-	Date	-
Bldg area m²	*266*	Ver area m²	-	Plan ref.	-

Government of South Australia
Department for Transport, Energy and Infrastructure

Strategic Asset Management Information System Plan

SAMIS 07713-01-8

ghd.com

→ The Power of Commitment

Appendix C

Bore Construction Licenses

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	425247
Expiry Date:	15/07/2023

Permission is hereby granted to: GHD PTY LTD
211 VICTORIA SQUARE
ADELAIDE SA 5000

MW01 (On-Site)

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5943/888
   Allotment 890 in Filed Plan 181532
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
21. Due to known soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well.

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.
6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 15/07/2022

Sonya Knight
Senior Water Licensing Officer
Delegate of Minister for Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	426117
Expiry Date:	26/08/2023

MW06 (Princess Street)

Permission is hereby granted to: GHD PTY LTD
ACN 008 488 373
LEVEL 4, 211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5359/69
   Allotment 861 in Filed Plan 182513
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
21. Due to known nearby soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well(s).
22. This permit authorises the construction of a well on the portion of road adjacent to the land parcel described above.

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

A Millhouse

Date: 26/08/2022

Alicia Millhouse
Water Licensing Officer
Delegate of Minister for Climate, Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	426109
Expiry Date:	18/08/2023

MW02 (Gawler Place)

Permission is hereby granted to: GHD PTY LTD
ACN 001 709 191
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5479/826
   Allotment 1 in Filed Plan 4460
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. This permit authorises the construction of a well on the portion of road adjacent to the land parcel described above.
21. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
22. Due to known nearby soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well(s).

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 18/08/2022

Alicia Millhouse
Water Licensing Officer
Delegate of Minister for Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	426111
Expiry Date:	19/08/2023

MW03 (Divett Place)

Permission is hereby granted to: GHD PTY LTD
ACN 001 709 191
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 6149/578
   Allotment 4 in Filed Plan 137918
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. This permit authorises the construction of a well on the portion of road adjacent to the land parcel described above.
21. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
22. Due to known nearby soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well(s).

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 19/08/2022

Alicia Millhouse
Water Licensing Officer
Delegate of Minister for Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	426112
Expiry Date:	18/08/2023

MW04 (Roper Street)

Permission is hereby granted to: GHD PTY LTD
ACN 001 709 191
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5836/846
   Allotment 10 in Filed Plan 16379
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. This permit authorises the construction of a well on the portion of road adjacent to the land parcel described above.
21. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
22. Due to known nearby soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well(s).

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

A Millhouse

Date: 18/08/2022

Alicia Millhouse
Water Licensing Officer
Delegate of Minister for Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	426113
Expiry Date:	18/08/2023

Permission is hereby granted to: GHD PTY LTD
ACN 001 709 191
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

MW05 (Chancery Lane)

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 6128/97
   Allotment 662 in Filed Plan 181504
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. This permit authorises the construction of a well on the portion of road adjacent to the land parcel described above.
21. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
22. Due to known nearby soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well(s).

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 18/08/2022

Alicia Millhouse
Water Licensing Officer
Delegate of Minister for Environment and Water

GOVERNMENT OF SOUTH AUSTRALIA

DEPARTMENT FOR ENVIRONMENT AND WATER

Mt Gambier Office | PO Box 1046 | Mt Gambier SA 5290 | [P] 8735 1134 [F] 8735 1135

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

Subject to full compliance with all the procedures, specifications and limitations contained or referred to, in the conditions set out below,

Permit No:	426114
Expiry Date:	19/08/2023

Permission is hereby granted to: GHD PTY LTD
ACN 001 709 191
LEVEL 4
211 VICTORIA SQUARE
ADELAIDE SA 5000

MW07 (Pulteney Street)

To undertake the following water affecting activity:

Activity: Well Construction

Well Use: Investigation

CONDITIONS:

1. The activity authorised by this permit must only be undertaken on the land described below:

   CT 5879/70
   Allotment 714 in Filed Plan 181556
   Hundred of Adelaide

2. The equipment, materials and methods used in drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, shall not adversely affect the quality of an underground water resource.
3. Aquifers shall be protected during drilling, plugging, backfilling or sealing of a well, or the replacement or alteration of the casing, lining or screen of a well, to prevent adverse impacts upon the integrity of the aquifer.
4. This work may be subject to inspection by the Department's Drilling Inspectors.
5. If this well is incidental/ancillary to mining operations authorised under the Mining Act 1971, or a regulated activity under the Petroleum and Geothermal Energy Act 2000 (Acts), the well must be decommissioned (as outlined in the Minimum Construction Requirements for Water Bores in Australia Fourth Edition) prior to the relinquishment of the licence or lease under the associated Acts, unless alternative formal arrangements can be made with the owner or occupier of the land on which the well is located subject to approval by the relevant Minister or the Minister's agent.
6. Activities shall not have an unacceptable detrimental impact on cultural, heritage or social values.
7. The activity must not adversely affect water-dependent ecosystems nearby.
8. The well driller must submit a Well Completion Report to the Department within 30 days of completion of each activity authorised by this well construction permit.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

9. Well Construction must comply with the mandatory requirements of the Minimum Construction Requirements for Water Bores in Australia (4th Edition) and the General Specifications for Well Drilling Operations Affecting Water in South Australia (or any subsequent or related policy), as provided by the relevant authority.
10. The authorised activity must be undertaken by a licensed driller.
11. If the well is considered unsatisfactory, it may be abandoned and a replacement well may then be constructed provided that the abandoned well is backfilled prior to the drill rig leaving the site.
12. Water samples are required from all wells drilled in respect of this permit.
13. Strata samples are not required.
14. The licensed well driller must forward with the report a plan obtained from the permit holder, who must mark thereon the location of all wells drilled in respect of this permit.
15. All wells must be drilled vertical unless written permission is obtained from the Minister.
16. Where a well passes or will pass through two or more aquifers, an impervious seal shall be made and maintained between the aquifers to prevent leakage between the aquifers.
17. All groundwater extracted during sampling and/or purging must be contained and disposed of in an appropriate manner to minimise risk to health and the environment.
18. A lithological log is to be submitted with the drillers well construction report from all wells drilled in respect of this permit as per the National Environmental Protection (assessment of Site Contamination) measure 1999.
19. Wells are to be backfilled when no longer required for ongoing monitoring and investigation purposes.
20. This permit authorises the construction of a well on the portion of road adjacent to the land parcel described above.
21. The well is not to penetrate beyond a depth of 25 metres unless approved by the Regional Hydrogeologist.
22. Due to known nearby soil/groundwater contamination in the sediments and aquifers above, caution should be taken in the drilling and/or cementing of this well(s).

NOTES:

1. Under section 216(1)(b)(ii) of the Act, you have a right of appeal to the Environment, Resources and Development Court against the imposition of any condition on this permit. The appeal must be instituted within six weeks of the date of permit issue. The appeal must also be served upon this department within that time.
2. This permit is not transferable.
3. This well construction permit is not an authorisation for a person to enter private property and prior authority must be obtained from the land owner in all circumstances.
4. The issue of this permit does not negate the requirement to comply with the provisions of other Acts that may impact on the activity undertaken pursuant to this permit.
5. This permit is not an approval to clear native vegetation.

PERMIT to undertake a WATER AFFECTING ACTIVITY

pursuant to section 112 of the Landscape South Australia Act 2019

WELL PERMIT

6. It is recommended that all drilling equipment be decontaminated prior to construction of a new well or rehabilitation of an existing well to prevent the introduction or transfer of iron bacteria. Similar precautions should also be taken with pump installation equipment.
7. Due to potential land contamination issues it is recommended that a hydrogeological assessment be carried out to determine the long term prospects for groundwater quality and quantity with regard to the site and desired use.
8. This permit does not authorise the taking of water from the well for any purpose other than testing.
9. If the extracted groundwater supply is required for human consumption, it is recommended that the water be quality tested.

TAKE NOTE that the permit holder, or a person acting on behalf of the permit holder, who contravenes or fails to comply with a condition of this permit is guilty of an offence, and such acts or ommisions may result in the variation, suspension or revocation of the permit.

Date: 19/08/2022

Alicia Millhouse
Water Licensing Officer
Delegate of Minister for Environment and Water

Appendix D

Well Survey Report

LINKUP CONSTRUCTION SURVEYS PTY LTD

`

To: Matt Bald
Company: GHD
Phone: 8111 6712

From: Lincoln Jeffery
Phone: 0414 840 569
Email: Lincoln@linkupconstructionsurveys.com.au

Date: 20/10/2022

Monitoring well coordinates – Adelaide MFS
Wakefield St, Adelaide

Well or Bore No.	Easting MGA20	Northing MGA20	R.L. Top of Casing A.H.D.	Natural Surface A.H.D.
GW103	281159.010	6132239.995	45.894	45.979
MW01	281146.719	6132220.460	45.820	45.906
MW02	280982.016	6132307.966	45.041	45.120
MW03	281110.870	6132303.036	45.210	45.263
MW05	281095.412	6132169.869	45.281	45.358
MW06	281237.719	6132074.370	46.390	46.480
MW07	281382.455	6132228.308	47.540	47.656

All Survey information was based from the MGA20 Z54 grid system and Australian Height Datum (AHD), Triangulated from Network Survey Marks.

Appendix E

Field Sheets

GHD CLIENTS | PEOPLE | PERFORMANCE

Daily Record Sheet

001

Client: MFS		Job No: 12583428	
Job Name: Adelaide Station DST		Date: 02/08/2022	
GHD Representative:	Matt Bold	Arrival Time: 10:00	Departure Time: 15:00
Weather Conditions:	(Please circle) Fine (Overcast) (Light Rain) (Heavy Rain) Other_____		
Works Being Undertaken:	On-site service clearance.		

Personnel/Contractor(s) Present (List all); Inducted into GHD H&SP?	Inducted	Arrival Time	Departure Time
Matt Bold (GHD)	✓	10:00	15:00
James Sanderson (Veris)	✓	10:00	15:00

Photographs Taken: (Please circle) (Yes) No If Yes, list below or attach photo register. Tech Folder.

Location	Time	Record of Activities / Issues Encountered / Discussions with Client/Contractors / Sketch / Notes
On-site	10:00	MB (GHD) and JS (Veris) inducted / sign-on to GHD JSEA, brief MFS site induction with Glen Phillis (MFS).
"	10:30	Commenced on-site service locating.
		Limited plans provided by MFS. Good detail on fire water main location.
		MB required to act as spotter for Veris service locator.
		Service location works covered:
		- on-site SW dam
		- on-site SW pipes in western and southern portions of site.
		- on-site water main.
		- on-site electrical.
		- on-site fuel systems, including line to 'day tank' under main building.
"	14:30	Notified of weather alert by Ben P. (GHD).
"	15:00	All personnel signed-out and left site.

Is a Notice of Proposed Variation, Variation Order or Site Instruction Required? (Please circle) Yes (No)

Provide Details:

Further Inspection and/or Testing Required on above Work:	Further service clearance to occur 03/08/2022.

Are there any H&S requirements to be considered for future works? N/A

Has the site been reinstated suitably (left clean and tidy)? ✓

GHD CLIENTS | PEOPLE | PERFORMANCE

Daily Record Sheet

001

Client: MFS		Job No: 12583428	
Job Name: Adelaide Station DSI		Date: 03/08/2022	
GHD Representative:	Matt Bold	Arrival Time: 0745	Departure Time: 1630
Weather Conditions:	(Please circle) (Fine) Overcast (Light Rain) Heavy Rain Other_____		
Works Being Undertaken:	On-site servia clearance (continued).		

Personnel/Contractor(s) Present (List all); Inducted into GHD H&SP?	Inducted	Arrival Time	Departure Time
Matt Bold (GHD)	✓	0745	1630
James Sanderson (Veris)	✓	0800	1615.

Photographs Taken: (Please circle) (Yes) No If Yes, list below or attach photo register. Tech Folder

Location	Time	Record of Activities / Issues Encountered / Discussions with Client/Contractors / Sketch / Notes
On-site	0745	MB (GHD) & JS (Veris) sign-in via MFS, conduct daily toolbox meeting, conduct HSE009 via GHD Smartapp.
	0815	On-site servia clearance Identification of: - Electrical (not all on MFS plans). - Stormwater - Gas (not on MFS plans) - Water - Sewer - Irrigation - UGTS / fuel lines - Comms - StateNet SAPOL O.F. (NOT ON PLANS - CRITICAL SERVICE) * Assistance from MFS/SAPOL to access pits for StateNet Fibre.
	1530	Locations selected for 18x soil bores, 1x GW monitoring well.
	1600	Pack-up, left site at 1630 after logistics discussions w/ MFS.

Is a Notice of Proposed Variation, Variation Order or Site Instruction Required? (Please circle) (Yes) No

Provide Details: On-site SC works likely exceeded allowed time.

Further Inspection and/or Testing Required on above Work:	On-site SC completed to satisfactory level.

Are there any H&S requirements to be considered for future works? N/A.

Has the site been reinstated suitably (left clean and tidy)? ✓

GHD CLIENTS|PEOPLE|PERFORMANCE

Daily Record Sheet

001

Client: MFS		Job No: 12583428	
Job Name: Adelaide Station DSI		Date: 04/08/2022	
GHD Representative:	Matt Bold, Ally Kirkman, BP	Arrival Time: 0830	Departure Time: 1630
Weather Conditions:	(Please circle) Fine Overcast Light Rain Heavy Rain Other_____		
Works Being Undertaken:	On-site GW MW installation " SB drilling.		

Personnel/Contractor(s) Present (List all); Inducted into GHD H&SP?	Inducted	Arrival Time	Departure Time
Matt Bold, Ally Kirkman (GHD Field Staff)	✓	0815/0845	1630
Ben Pettigrew (GHD PD)	✓	0845	0945
Ian Watt (WB Drilling)	✓	0830	1630
David Watt (WB Drilling)	✓	0830	1630

Photographs Taken: (Please circle) Yes No If Yes, list below or attach photo register. Tech Folder

Location	Time	Record of Activities / Issues Encountered / Discussions with Client/Contractors / Sketch / Notes
On-site	0830	MFS inductions for drillers.
~~08~~		
	0900	Daily toolbox, JSEA sign-on, HSE009 submission. - all personnel present.
	0915	Begin drilling MW01, gauged near-by existing wells, SWL ~ 11.5 - 12 m bgl. - CC through pavers - HA to 0.9 m bgl - SA to 15 m bgl. - infilled w/ 5m screen, 10 - 15 m bgl.
	1245	Drilling, installation and clean-up at MW01 complete.
		2x full waste drums to collect from site via Cleanaway.
	1315	Completed BH09. Target depth 2.5 m bgl achieved.
	1345	Completed BH11. Refusal 0.6 m bgl. Possible services. Abandoned.
	1415	BH12. Target 2.5 m bgl achieved.
	1500	BH13 Target 2.5 m bgl achieved.
	1545	BH06. Target 2.5 m bgl achieved.
	1630	Pack-up completed / decon. All personnel off-site.

Is a Notice of Proposed Variation, Variation Order or Site Instruction Required? (Please circle) Yes (No)

Provide Details: As per SAQP scope.

Further Inspection and/or Testing Required on above Work:	Continue w/ soil bore drilling 05/08/2022

Are there any H&S requirements to be considered for future works? N/A

Has the site been reinstated suitably (left clean and tidy)? ✓

GHD CLIENTS | PEOPLE | PERFORMANCE

Daily Record Sheet

001

Client: MFS		Job No: 12583428	
Job Name: Adelaide Station DSI		Date: 05/08/2022	
GHD Representative:	Matt Bold, Ally K.	Arrival Time: 0800	Departure Time: 1700
Weather Conditions:	(Please circle) Fine (Overcast) (Light Rain) (Heavy Rain) Other_____		
Works Being Undertaken:	On-site SB drilling		

Personnel/Contractor(s) Present (List all); Inducted into GHD H&SP?	Inducted	Arrival Time	Departure Time
Matt Bold (GHD)	✓	0800	1700
Ally Kirkman (GHD)	✓	0800	1700
Ian Watt (WB Drilling)	✓	0800	1630
David Watt (WB Drilling)	✓	0800	1630

Photographs Taken: (Please circle) (Yes) No If Yes, list below or attach photo register. Tech Folder.

Location	Time	Record of Activities / Issues Encountered / Discussions with Client/Contractors / Sketch / Notes
On-site.	0800	Daily toolbox, JSEA review, HJED9 sign-on.
	0900	BH07. Refusal @ 1.4 m bgl w/ Push tube. Packing stand at 1.0-1.4 Possible service / U.G. infrastructure? Abandoned.
	0930	BH08. Wire encountered @ ~0.7 m bgl.
		* James Sanderson (Vers) on-site ~0950 - 1030 to confirm no service identifiable, discussed w/ B.P. & MFS.
	1030	Completed BH08, target 2.5 m bgl achieved.
	1130	Heavy rain @ site, brief stand down.
	1145	BH09. Target 2.5 m bgl achieved. Some core loss due to moisture, HC odour, 20-30 ppm PID readings identified.
	1300	BH14. Target 2.5 m bgl achieved.
	1345	BH15. Target 2.5 m bgl achieved.
	1445	BH16. Target 2.5 m bgl achieved.
	1530	BH18. > Target. 2.5 m bgl achieved.
	1615	BH09B. Return ~0.7 m south BH09, drilled to 3.8 m bgl (HC delineation)
	1630	Drillers off-site.
		1 x additional waste drum for Clearaway. Potential HC soil.
	1700	MB / AK pack-up, label and store waste drums, off-site by 1700.

Is a Notice of Proposed Variation, Variation Order or Site Instruction Required? (Please circle) (Yes) No

Provide Details: Additional SB for HC delineation to 4 m bgl. 3 x SB locations from PFAS DSI remain

Further Inspection and/or Testing Required on above Work: Still to-do: BH04 (right access), BH10, BH17 (HA).

Are there any H&S requirements to be considered for future works? N/A

Has the site been reinstated suitably (left clean and tidy)? ✓

GHD CLIENTS PEOPLE PERFORMANCE

Daily Record Sheet

001

Client: MFS		Job No: 12583428	
Job Name: Adelaide Station DSI		Date: 11/08/2022	
GHD Representative:	Matt Bald, Ally Kirkman	Arrival Time: 1030	Departure Time: 1430
Weather Conditions:	(Please circle) Fine Overcast Light Rain Heavy Rain Other_____		
Works Being Undertaken:	MW01 Development, 2x HA SBs.		

Personnel/Contractor(s) Present (List all); Inducted into GHD H&SP?	Inducted	Arrival Time	Departure Time
Matt Bald (GHD)	✓	1030	1430
Ally Kirkman (GHD)	✓	1030	1430

Photographs Taken: (Please circle) Yes No If Yes, list below or attach photo register. Tech Folder.

Location	Time	Record of Activities / Issues Encountered / Discussions with Client/Contractors / Sketch / Notes
On-site	1030	Daily ~~toolbox~~, JSEA review, HSE09 submission.
	1100	Gauging + well development of MW01.
		- Surging
		- removal of ~14 L before well dry.
		- SS bailer methodology.
	1215	Pack-up GW, store waste (1x liquid waste drum).
	1315	BH10. Refused @ 1.4 m bgl. HA only - Stiff clay. Natural.
	1405	BH17. Refused @ 0.55 m bgl. HA only. Rock/gravel/hard material. Tried 2x at location to advance ~~BH~~ further without success.
	1430	All personnel off-site.

Is a Notice of Proposed Variation, Variation Order or Site Instruction Required? (Please circle) Yes (No)

Provide Details: As per SAQP scope.

Further Inspection and/or Testing Required on above Work: May need to return to attempt BH17 with mechanical drill rig.

Are there any H&S requirements to be considered for future works?
Has the site been reinstated suitably (left clean and tidy)?

Groundwater Gauging Sheet

Client: MFS	**WL Meter Type: Dip / Fox / Int.Fce / Gge**
Project: Adelaide Station DSI	**Date:** 04/08/2022
Job No.: 12583428	**Time:** 0900 – 1030.
Location: Adelaide Fire Station.	**Sampler:** MB/AK.

Location / Bore ID	Stick up (m)	SWL (mbTOC)	Thickness of NAPL (mm)	Comment
GW105	–	11.931m		16.4m total depth
GW103	–	11.872m		14.1m total depth

MW02

10:30

DTW - 17.525

20.6 C

0.15 DO

5103 C

6.8 ph

~~147.2~~

145.1 ORP

12:00

~~GW103~~ MW01

DTW - 11.960

20.3

0.68

12491

6.46

276.3

5/10/22

11:00

MW05

DTW - 11.50

TWD - 15.00

21 C

0.28 DO

13219 C

6.59 ph

175.10RR

GW103

~~Added~~ 11:30

DTW - 11.90

TWD - 15:00

20.9 °C

0.21 DO

14595

6.38 pH

227.9 ORP

GW103 – North 11.960
GW105 – West 11.990

GW105

DTW = 11.990 12:38
TWA = 15.00
20.2 C
0.98 DO
9313 EC
6.57 pH
411.2 Redox

Purging and Sampling Record

Bore ID: MW01

Job Information

Client: MFS
Project: 12583428
Proj. No.: Adelaide Station DSI
Sampler: MB, AK
Date: 11/08/2022
Round: Development

Sampling Information

Purge Method: SS Bailer
Sample Method: N/A
WQ Meter Type: YSI Pro Plus
Flow Cell: Y / (N) Pump Depth: ~ m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
Field Filtered? Y / N (filter vessel, disposable filter/syringe)

Bore Information

SWL(mbTOC): 11.930 m Logic Check:
Screen: From: 10 to 15 m Stick Up: m
NAPL Check: N/A Bore Diam.: 50 mm
Ref.datum: Well Cap Secure? Y
Bore Depth: 15.05 m

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (µS/cm)	Dis.Oxygen (mg/L)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):		-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*		
	1.0	20	6.56	13826	0.90	171.4			Orange-brown, turbid, no odour, no sheen
	5.0	19.8	6.65	13614	1.71	164.8			orange-brown, turbid, no odour, no sheen
	10.0	19.8	6.79	13399	1.86	151.0			orange-brown, turbid, no odour, no sheen
	~~15.0~~ 13.5	19.7	7.08	12835	1.83	144.3	14.855		orange-brown, very turbid, no odour, no sheen
									Near-dry after 14.0 L removed.

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Development only, no sample collected

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

BOREHOLE LOG

Environmental

Bore No.: BH17
Page: 1 of 1

Client:	**Drilling Co.:**	**Easting:** 0
Project:	**Driller:**	**Northing:** 0
Job No.:	**Rig Type:**	**Grid Ref:**
Location:	**Total Depth (m):**	**Collar RL:**
Date Drilled: 11/8/22 to: 11/8/22	**Diameter (mm):**	**Logged by:** **Checked by:**

DRILLING												
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0							0.0-0.1; topsoil, Sandy CLAY; dark brown, trace OM.	M	Soft	no odour.	0.00
			0.2	0.1-0.2			0.1-0.35; FILL; Sandy CLAY; orange-brown, LP, trace rootlets	M	Soft	no odour.	
1.0											
			0.1	0.4-0.5			0.35-0.55; FILL; gravelly SAND; grey-brown,	D	L	grey/black material, suspected anthropogenic	
2.0											
							E.O.H. @ 0.55 mbgl Refusal on rock/ ground/ hard surface				
3.0											
4.0											
5.0											
6.0											
7.0											
8.0											
9.0											
10.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH10
Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: 11/8/22 to: 11/8/22

Drilling Co.:
Driller:
Rig Type:
Total Depth (m): 1.4
Diameter (mm): ~90.

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING							SOIL DESCRIPTION			CONTAMINANT INDICATORS	
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0							0-0.1; FILL; topsoil; silty CLAY; dark brown, OM, rootlets	M	Soft	no odour	0.00
				0.1-0.2							
1.0			0.0				0.1-0.45; FILL; sandy CLAY; brown, M-C sands, trace rootlets	M	Soft	no odour	
0.5			0.0	0.4-0.5 (2J) MW8			0.45-0.9; SAND; light brown, M-C sands, trace gravels	Sl. M.	L	trace brick fragments, etc.	
2.0											
1.0				0.9-1.0 (2J)			0.9-1.1; Sandy CLAY; brown	Sl. M	St.	trace brick fragments	
5.0				1.3-1.4			1.1-1.4; Sandy CLAY; brown w/ grey mottling, F-M sands, trace calcareous deposits.	Sl. M	St.	no odour.	
1.5							E.O.H. @ 1.4 m bgl				
7.0											
8.0											
9.0											
10.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

*samples labelled as BH09.

BOREHOLE LOG

Environmental

Bore No.: BH05

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING												
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
0.0							Ground Surface				0.00
		HA					0.0-0.08; Fill; Pavement				0.00
		HA	0.1	0.1-0.2			0.08-0.4; Fill; Gravelly SAND; black	sl. M	L	no odour	
0.5		HA	0.0	0.4-0.5			0.4-0.9; Sandy CLAY; brown, sl. stiff, D, trace gravels	sl. M	So	trace brick fragments	
1.0		PT	0.0	1.0-1.1			0.9-1.3; Sandy CLAY; brown-orange	sl. M	So	-	
1.5		PT	0.0	1.5-1.6			1.3-2.5; CLAY; light brown-grey, sl. soft, HP	sl M.	St.	-	
2.0			0.0	2.4-2.5							
2.5							E.O.H. @ 2.5 mbgl				
3.0											
4.0											
5.0											
6.0											
7.0											
8.0											
9.0											
10.0											

NOTES:

HA = Hand Auger
PT = Push Tube

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH11
Page: 1 of 1

Client:	**Drilling Co.:**	**Easting:** 0
Project:	**Driller:**	**Northing:** 0
Job No.:	**Rig Type:**	**Grid Ref:**
Location:	**Total Depth (m):**	**Collar RL:**
Date Drilled: to:	**Diameter (mm):**	**Logged by:** Checked by:

DRILLING												
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0		HA		Duplicate			0-0.1 pavement				0.00
		HA		0.1-0.2			gravel SAND	D	L	No odour	
0.5		HA		0.4-0.5			SAND; orange/brown trace quartz gravel				
							medium-coarse SAND				
3.0							EOH - refusal on unknown material 4) service locater advised HA				
7.0											

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH2

Page: 1 of 1

Client:	Drilling Co.:	Easting: 0	
Project:	Driller:	Northing: 0	
Job No.:	Rig Type:	Grid Ref:	
Location:	Total Depth (m):	Collar RL:	
Date Drilled: to:	Diameter (mm):	Logged by:	Checked by:

DRILLING							SOIL DESCRIPTION			CONTAMINANT INDICATORS	
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0		CC					0-0.1 pavement				0.00
		HA		0.1-0.2 (2J)			0.1-0.3 gravely SAND black/grey	D	L	No odour	
		HB		0.4-0.5			0.3-1.2 sandy CLAY brown/grey fine-coarse sands (wet at 1.0)	SL M	M O	-Trace brick fragments - Trace black material	
		PT		1.0-1.1			1.2-2.0 sandy CLAY red-brown fine-medium sands	SL M	ST	No odour	
		PT		1.5-1.6							
							2.0-2.5 CLAY brown-grey trace fine sands	SL M	SL S	No odour	
				2.4-2.5							

NOTES: CC = concrete core

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH13

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING												
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
0.0							Ground Surface				0.00
0.0		CC					0.0 - 0.1; Fill; pavement	D		—	0.00
			0.2	0.1 - 0.2			0.1 - 0.4; Gravelly SAND; light brown, F-C sands	D	L	no odour	
0.5		HA									
			0.3	0.4 - 0.5			0.4 - 0.6; Sandy CLAY; brown, F-M sands	SL M.	Soft	trace brick fragments, no odour	
							0.6 - 1.0; Gravelly SAND; grey, F-M sands	D	L	concrete?	
1.0			0.0	0.9 - 1.0			1				
							1.0 - 1.7; Sandy CLAY; brown - orange/brown, F-M sands	SL M	Soft	no odour	
		PT	0.3	1.4 - 1.5							
							1.7 - 2.5; CLAY; light brown, high plasticity		St	no odour.	
2.0			0.3	2.4 - 2.5							

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH06

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING								SOIL DESCRIPTION			CONTAMINANT INDICATORS	
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log		Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
								Ground Surface				0.00
0.0		CC						0.0-0.1 fill, pavement	D		—	0.00
		HA	0.0	0.1-0.2				0.1-0.3 gravelly SAND light brown, sub angular gravels <15mm d)	SL M	L	No odour	
0.5		HA	0.1	0.4-0.5				0.3-0.8 sandy CLAY dark brown, fine-medium sands, low plasticity	SL M	LP	Trace brick fragments	
1.0				1.0-1.1				0.8-1.5 sandy CLAY red-brown, fine sands	SL M	ST	Brick fragment ~1.0m	
			0.1									
1.5				1.6-1.7				1.5-2.5 CLAY grey-brown, medium plasticity	D	ST	No odour	
2.0												
2.5			0.3	2.4-2.5								

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH07

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING							SOIL DESCRIPTION			CONTAMINANT INDICATORS	
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0							0.0 - 0.03; fill; pavement	-	-		0.00
			0.2	BH07_ 0.1-0.2			0.03 - 0.3; Gravelly SAND; light brown	SL M	L	no odour	
0.5			0.2	BH07_ 0.4-0.5 + FD01 + FS01			0.3 - 1.0; Sandy CLAY; dark brown, LP, F-M sands	SL M	SL Soft	~~trace bricks~~ brick fragments	
				BH07_0.9-1.0							
1.0			0.1	BH07_ 1.3-1.4			1.0 - 1.4; SAND; brown, M sands,	SL M	L	black material at E.O.H. (?).	
1.5							E.O.H. @ 1.4 m bgl Refusal on hard material (unknown). Discontinued due to risk of potential service.				

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH08.
Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING								SOIL DESCRIPTION			CONTAMINANT INDICATORS	
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log		Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
0.0								Ground Surface				0.00
		CC						0-0.08; FILL; pavement	-	-	-	0.00
			0.1	0.1-0.2 FD02 FS02				0.1-0.3 gravelly SAND light brown.	SL M	L		
		HA		0.4-0.5 (2D)				0.3-0.8 sandy CLAY brown, black, grey	SL M	S	Brick fragments, wire, scrap metal	
		PT	0.1	1.0-1.1				0.8-1.3 sandy CLAY orange, brown	SL M	SL S	Coarse black material at 1m	
								1.3-1.8 clay SAND orange, brown	SL M	MD	No odour	
			0.1	1.6-1.7								
								1.8-2.5 CLAY grey with orange mottling medium plasticity	D	ST	No odour	
			0.1	2.4-2.5								

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH09

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING

Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
0.0							Ground Surface				0.00
		CC		0.1-0.2			0-0.1 fill, pavement				0.00
0.5		HA	11.2	0.4-0.5			0.1-0.3 gravelly SAND light brown 0.3-1.0 sandy CLAY dark grey			Brick frag Mod hydrocarbon odour	
1.0		PT	11.2	1.1-1.2			1.0-2.5 CLAY (sandy) grey, brown			Mod hydrocarbon odour	
1.5											
2.0											
2.5			22.1	2.3-2.4							

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993

BOREHOLE LOG

Environmental

Bore No.: BH4

Page: 1 of 1

Client:		Drilling Co.:	Easting: 0
Project:		Driller:	Northing: 0
Job No.:		Rig Type:	Grid Ref:
Location:		Total Depth (m):	Collar RL:
Date Drilled:	to:	Diameter (mm):	Logged by: Checked by:

DRILLING												
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0		CC					0.0 - 0.08; FILL; pavement	-	-	no odour	0.00
			0.1	0.1-0.2 + FD03 + FS03			0.08 - 0.35; Gravelly SAND; FILL; grey-brown,	SI M	L	no odour	
0.5		HA	0.1	0.4-0.5			0.35 - 0.6; Gravelly SAND; light brown,	SI M	L	no odour	
							0.6 - 1.3; Sandy CLAY; FILL, trace rootlets	SI M	SI Soft	brick fragments,	
1.0			0.1	1.0-1.1							
1.5		PT					1.3 - 1.8; Sandy CLAY; dark brown,	D	Soft	no odour	
			0.0	1.6-1.7							
2.0							1.8 - 2.5; CLAY; grey w/ trace red-orange mottling	D	St.	no odour	
2.5			0.0	2.4-2.5							

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

BOREHOLE LOG

Environmental

Bore No.: BH15

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING							SOIL DESCRIPTION			CONTAMINANT INDICATORS	
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
0.0							Ground Surface				0.00
0.0		CC					0.0 - 0.08; FILL; pavement.				0.00
			0.1	0.1 - 0.2			0.08 - 0.6; FILL; gravelly SAND; grey-black;	sl m	L	no odour	
0.5			0.1	0.4 - 0.5							
							0.6 - 1.1; Sandy CLAY; grey-orange, trace gravels	sl m.	sl. soft	no odour	
1.0			0.0	0.9 - 1.0							
							1.1 - 1.9; Sandy CLAY; grey-blue/green, trace brown/ogre mottling,	sl m	Stiff	HC blue appearance, no odour, no PID	
1.5			0.0	1.6 - 1.7							
							1.9 - 2.5; CLAY; grey/ orange-brown mottling	D	stiff	no odour	
2.0											
2.5				2.4 - 2.5							

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993

BOREHOLE LOG

Environmental

Bore No.: BH16

Page: 1 of 1

Client:
Project:
Job No.:
Location:
Date Drilled: to:

Drilling Co.:
Driller:
Rig Type:
Total Depth (m):
Diameter (mm):

Easting: 0
Northing: 0
Grid Ref:
Collar RL:
Logged by: Checked by:

DRILLING													
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
0.0							Ground Surface				0.00
0.0		CC					0.0-0.1 fill, pavement				0.00
			0.1	0.1-0.2 FD04 FS04			0.1-0.35 fill, gravelly SAND light brown	SL M			
0.3		HA		0.4-0.5 (2J)			0.35-0.7 sandy CLAY	SL M		Waste fragments	
			00				0.7-1.2 sandy CLAY red. brown	D	St		
		PT									
1.0											
			00	1.0-1.1							
							1.2-2.5 CLAY grey, brown with trace orange mottling	D	SL soft	No odour	
1.5											
							slightly soft, stiffer pas + 1.8m		stiffer		
			00	1.6-1.7							
2.0											
2.5			00	2.4-2.5							

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993

BOREHOLE LOG

Environmental

Bore No.: BH18

Page: 1 of 1

Client:	Drilling Co.:	Easting: 0
Project:	Driller:	Northing: 0
Job No.:	Rig Type:	Grid Ref:
Location:	Total Depth (m):	Collar RL:
Date Drilled: to:	Diameter (mm):	Logged by: Checked by:

DRILLING												
Depth (m)	Field Rank	Sample Method	PID (ppm)	Sample ID	Water	Graphic Log	SOIL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture Condition	Consistency	CONTAMINANT INDICATORS Odours, staining, waste materials, separate phase liquids, imported fill, ash.	Depth/ Elevation (m)
							Ground Surface				0.00
0.0		CC					0.0-0.18 fill, concrete				0.00
0.2		HA	0.1	0.2-0.3			0.18-0.4 gravelly SAND orange brown → dark brown	D	L	No odour	
0.5							0.4-1.2 sandy CLAY dark brown	D			
1.0			0.1	0.5-0.6							
1.2			0.2	1.0-1.1							
1.5		PT					1.2-2.5 CLAY orange brown ↓ pale brown low plasticity	D	stiff	No odour	
2.0			0.2	1.6-1.7							
2.5			0.2	2.4-2.5							

NOTES:

GHD Soil Classifications: The GHD Soil Classification is based on Australian Standards AS 1726-1993.

Purging and Sampling Record

Bore ID: MW07

Job Information

Client: MFS
Project: 12583428
Proj. No.: Adelaide Stn OSI
Sampler: SC, AK
Date: 21/9/22
Round: Development

Sampling Information

Purge Method: SS Bailer
Sample Method: N/A
WQ Meter Type: YSI Pro Plus
Flow Cell: Y / N Pump Depth:.....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
Field Filtered? Y / N (filter vessel, disposable filter, filter/syringe)

Bore Information

SWL(mbTOC): ~~15.580~~ 13.535 m Logic Check: .....
Screen: From:.....to..... m Stick Up: ..... m
NAPL Check: N/A Bore Diam.: 50 mm
Ref.datum: ..... Well Cap Secure? Y
Bore Depth: 15.580 m

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: orange brown, h Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
	9	19.1	6.53	8908	~~7~~.39	124.1	13.535	15.580	2.045 ×4≈ ~~8.18~~ 8.18
	18	20.6	~~6.47~~	9173	4.81	86.5			
	27	20.5	6.47	9544	5.18	56.7	13.800		orange brown, high turbidity, no odour, no sheen, high sediment load

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW06

Job Information

Client: MFS
Project: 12583428
Proj. No.: Adelaide Stn DSI
Sampler: SC / AK
Date: 21/9/22
Round: Development

Sampling Information

Purge Method: SS Bailer
Sample Method: N/A
WQ Meter Type: YSI Pro Plus
Flow Cell: Y / N Pump Depth: .....m
WLevel Meter Type: Dip / Fox / Int.Fce / Gge
Field Filtered? Y / N (filter vessel, disposable filter, filter/syringe)

Bore Information

SWL(mbTOC): 11.866 m Logic Check: .....
Screen: From: .....to..... m Stick Up: ..... m
NAPL Check: N/A Bore Diam.: 50 mm
Ref.datum: ..... Well Cap Secure? Y
Bore Depth: 14.115 m

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
	9	20.1	6.76	11146	15.55	98.1	11.866		8.996
	18	19.9	6.79	11471	3.55	57.7			
	27	20.0	6.78	11827	4.88	88.3	12.035		> orange brown, high turbidity, no odour, no sheen, high sediment load > slower recharge than MW07 ??

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Purging and Sampling Record

Bore ID: MW03

Job Information		Sampling Information		Bore Information	
Client:	MFS	Purge Method:	SS Bailer	SWL(mbTOC):	11.796 m
Project:	Adelaide Stn DSI	Sample Method:	N/A	Screen: From:	to: m
Proj. No.:	12583428	WQ Meter Type:	YSI Pro Plus	NAPL Check:	N/A
Sampler:		Flow Cell: Y / N	Pump Depth: m	Ref.datum:	
Date:	21/9/22	WLevel Meter Type:	Dip / Fox / Int.Fce / Gge	Bore Depth:	17.72 m
Round	Development	Field Filtered? Y / N (filter vessel, disposable filter, filter/syringe)			

Logic Check: ..... Stick Up: ..... m Bore Diam.: 50 mm Well Cap Secure? Y

Time (.....)	Volume (L)	Temp (°C)	pH (pH units)	Elec.Cond (.....)	Dis.Oxygen (.....)	Ox-Red Pt. (± mV)	SWL (m TOC)	(.....)	Comment: Colour, turbidity, sediment load, sheen, odour, flow rate, purged dry?
Stable when (3 consecutive readings):	-	*+/- 0.05 pH*	*+/- 3%*	*+/- 10%*	*+/- 10 mV*	*stable*			
	24	20.4	7.0	9649	6.49	82.3		11.796	24L x 3
								↓	
								17.305	DRY at 34L
									- orange brown, medium turbidity, no odour, no sheen, medium sediment load

Field QA Checks:

Air bubbles in vials? Y / N Any violent reactions? Y / N
Decontamination as per GHD procedure? Y / N
Was sampling equipment pre-cleaned? Y / N
COC updated? Y / N

Parameters	BTEX	TPH	PAH	CHC	PCB	OCP	OPP	Tot. Metal	Biol.				
Preservatives													

Comment: Duplicate samples collected, bottles used, access, condition of headworks etc

Purge Volumes

Casing Int. Dia (mm)	50	100	150
Vol (L/m of casing)	2.0	7.9	17.7

*Double for gravel pack

Appendix F

Borehole logs

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH05

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 04/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281135
Northing 6132218
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA					PAVEMENT; (FILL).			no odour, no staining.	
0.2		0.0	BH05_0.1-0.2			Gravelly SAND;, black (FILL).	SM	L	no odour, no staining.	-0.2
0.4		0.1	BH05_0.4-0.5			Sandy CLAY;, brown, slightly stiff, trace gravels (NATURAL).	SM	S	no odour, no staining, trace brick fragments.	-0.4
0.6										-0.6
0.8										-0.8
	PT					As above; colour change to brown-orange (NATURAL).	SM	S	no odour, no staining.	
1		0.0	BH05_1-1.1							-1
1.2										-1.2
1.4						CLAY;, high plasticity, brown-gray, slightly soft (NATURAL).	SM	ST	no odour, no staining.	-1.4
1.6		0.0	BH05_1.5-2							-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4		0.0	BH05_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH06

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 04/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281137
Northing 6132193
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
	HA	0.0	BH06_0.1-0.2			Gravelly SAND;, light brown, sub-angular gravels (15 mmd) (NATURAL).	SM	L	no odour, no staining.	
0.2										-0.2
						Sandy CLAY;, dark brown, fine medium sands (NATURAL).	SM	LP	no odour, no staining, trace brick fragments.	
0.4		0.1	BH06_0.4-0.5							-0.4
0.6										-0.6
0.8						Sandy CLAY;, red brown, fine sands (NATURAL).	SM	ST	no odour, no staining, brick fragment - 1.0 m.	-0.8
1		0.1	BH06_1-1.1							-1
1.2										-1.2
1.4										-1.4
						CLAY;, medium plasticity, grey-brown (NATURAL).	D	ST	no odour, no staining.	
1.6		0.1	BH06_1.6-1.7							-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4		0.3	BH06_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH07

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method HA
Total Depth (m) 1.4
Diameter (mm) 50

Easting 281152
Northing 6132182
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA					PAVEMENT (FILL).			no odour, no staining.	
		0.2	BH07_0.1-0.2			Gravelly SAND;, light brown (NATURAL).	SM	L	no odour, no staining.	
0.2										-0.2
						Sandy CLAY;, low plasticity, dark brown, fine to medium sands (NATURAL).	SM	SL	no odour, no staining, mtb, brick fragment.	
0.4		0.2	BH07_0.4-0.5 FD01 FS01							-0.4
0.6										-0.6
0.8										-0.8
		0.0	BH07_0.9-1							
1						SAND;, medium grained, brown (NATURAL).	SM	SM	no odour, no staining, blue material at the end of hole.	-1
1.2										-1.2
		0.1	BH07_1.3-1.4							
1.4						Termination Depth at: 1.40 m. Target Depth Achieved at 1.4 m.				-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6

Notes Refusal on hard material (unknown). Discontinued due to risk of potential service

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH08

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281153
Northing 6132168
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
0.2	HA	0.1	BH08_0.1-0.2 FD02 FS02			Gravelly SAND;, light brown (NATURAL).	SM	L	no odour, no staining.	-0.2
0.4		0.0	BH08_0.4-0.5 (2J)			Sandy CLAY;, brown, black and grey (NATURAL).	SM	S	no odour, no staining, brick fragement, wire, scrap metal.	-0.4
0.6										-0.6
0.8						As above; colour change to orange, brown (NATURAL).	SM	SS	no odour, no staining, coarse black material at 1 m.	-0.8
1	PT	0.1	BH08_1-1.1							-1
1.2										-1.2
1.4										-1.4
1.6		0.1	BH08_1.6-1.7							-1.6
1.8						CLAY;, medium plasticity, grey with orange motling (NATURAL).	D	ST	no odour, no staining.	-1.8
2										-2
2.2										-2.2
2.4		0.1	BH08_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH09

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281159
Northing 6132180
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
	HA	0.0	BH09_0.1-0.2			Gravelly SAND;, light brown (FILL).	SM	L	no odour, no staining.	
0.2										-0.2
						Sandy CLAY;, dark grey (NATURAL).	SM	S	mod hydrocarbon odour, no staining.	
0.4		11.2	BH09_0.4-0.5							-0.4
0.6	PT									-0.6
0.8										-0.8
1										-1
						As above; colour change to grey, brown (NATURAL).	SM	S	mod hydrocarbon odour, no staining.	
		11.2	BH09_1.1-1.2							
1.2										-1.2
1.4										-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
						Termination Depth at: 2.50 m. Target Depth Achieved.				
2.6										-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH10

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method HA
Total Depth (m) 1.4
Diameter (mm) 50

Easting 281157
Northing 6132250
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	HA					Silty CLAY;, dark brown, OM, rootlets (FILL).	M	S	no odour, no staining.	0
		0.0	BH10_0.1-0.2			Sandy CLAY;, medium to coarse grained, brown, trace rootlets (FILL).	M	S	no odour, no staining.	
0.2										-0.2
0.4		0.0	BH10_0.4-0.5 MTB			SAND;, medium to coarse grained, light brown, trace gravels (NATURAL).	SM	L	no odour, no staining.	-0.4
0.6										-0.6
0.8										-0.8
		0.0	BH10_0.9-1 (2J)			Sandy CLAY;, brown (NATURAL).	SM	ST	no odour, no staining.	
1										-1
						Sandy CLAY;, fine to medium grained, brown w/ grey mottling, trace calcerous (NATURAL).	SM	ST	no odour, no staining.	
1.2										-1.2
		0.0	BH10_1.3-1.4							
1.4						Termination Depth at: 1.40 m. Target Depth Achieved at 1.4 m.				-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH11

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 04/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method HA
Total Depth (m) 0.7
Diameter (mm) 50

Easting 281155
Northing 6132229
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA					PAVEMENT (FILL).			no odour, no staining.	
		0.0	BH11_0.1-0.2			Gravelly SAND;, medium to coarse grained, orange/brown, trace quartz gravel (FILL).	D	L	no odour, no staining.	
0.2						SAND; (NATURAL).			no odour, no staining.	-0.2
0.4		0.0	BH11_0.4-0.5							-0.4
0.6										-0.6
0.8						Termination Depth at: 0.70 m. Target Depth Achieved at .7 m.				-0.8
1										-1
1.2										-1.2
1.4										-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6

Notes Refusal on unknown material as service locater advised (HA)

This log is not intended for geotechnical purposes.

Drilling Abbreviations

AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler

Moisture Abbreviations

D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations

Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense

Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH12

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 04/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281157
Northing 6132216
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
	HA	0.0	BH12_0.1-0.2 (2J)			Gravelly SAND;, black/grey (NATURAL).	D	L	no odour, no staining.	
0.2										-0.2
						Sandy CLAY;, brown/grey, fine to coarse sand, wet at 1.0 m (NATURAL).	SM	MD	no odour, no staining, trace brick fragmetns, trace black material.	
0.4		0.0	BH12_0.4-0.5							-0.4
0.6										-0.6
0.8										-0.8
1		0.0	BH12_1-1.1							-1
1.2	PT					As above; colour change to red to brown, fine to medium sands (NATURAL).	SM	ST	no odour, no staining.	-1.2
1.4										-1.4
		0.0	BH12_1.5-1.6							
1.6										-1.6
1.8										-1.8
2						CLAY;, brown/grey, trace fine sands (NATURAL).	SM	SS	no odour, no staining.	-2
2.2										-2.2
2.4		0.0	BH12_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH13

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 04/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281167
Northing 6132234
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).	D		no odour, no staining.	
	HA	0.2	BH13_0.1-0.2			Gravelly SAND;, fine to coarse grained, light brown (NATURAL).	D	L	no odour, no staining.	
0.2										-0.2
0.4		0.3	BH13_0.4-0.5			Sandy CLAY;, brown, fine to medium (NATURAL).	SM	S	no odour, no staining, trace brick fragments.	-0.4
0.6	PT									-0.6
						Gravelly SAND, fine to medium grained, grey (NATURAL).	D	L	no odour, no staining, concrete.	
0.8										-0.8
		0.0	BH13_0.9-1							
1										-1
						Sandy CLAY;, brown to orange brown, fine to medium (NATURAL).	SM	S	no odour, no staining.	
1.2										-1.2
1.4		0.3	BH13_1.4-1.5							-1.4
1.6										-1.6
						CLAY;, high plasticity, light brown (NATURAL).		ST	no odour, no staining.	
1.8										-1.8
2										-2
2.2										-2.2
2.4		0.3	BH13_2.4-2.5							-2.4
						Termination Depth at: 2.50 m. Target Depth Achieved.				
2.6										-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH14

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281190
Northing 6132205
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
	HA	0.1	BH14_0.1-0.2 FD03 FS03			Gravelly SAND;, grey to brown (FILL).	SM	L	no odour, no staining.	
0.2										-0.2
0.4		0.1	BH14_0.4-0.5			Gravelly SAND;, light brown (FILL).	SM	L	no odour, no staining.	-0.4
0.6	PT					Sandy CLAY;, tree rootlets (FILL).	SM	SS	no odour, no staining, brick fragments.	-0.6
0.8										-0.8
1		0.1	BH14_1-1.1							-1
1.2										-1.2
1.4						Sandy CLAY;, dark brown (NATURAL).	D	S	no odour, no staining.	-1.4
1.6		0.0	BH14_1.6-1.7							-1.6
1.8						CLAY;, grey with tree red orange mottling (NATURAL).	D	ST	no odour, no staining.	-1.8
2										-2
2.2										-2.2
2.4		0.0	BH14_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH15

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281210
Northing 6132206
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
	HA	0.1	BH15_0.1-0.2			Gravelly SAND;, grey-black (FILL).	SM	L	no odour, no staining.	
0.2										-0.2
0.4		0.1	BH15_0.4-0.5							-0.4
0.6						Sandy CLAY;, grey-orange, trace gravels (NATURAL).	SM	SL	no odour, no staining.	-0.6
0.8										-0.8
1		0.0	BH15_0.9-1							-1
		0.0	BH15_1-1.7							
1.2						Sandy CLAY;, grey-blue green, trace brown mottling (NATURAL).	SM	ST	no odour, no staining, hc blue appearance.	-1.2
1.4										-1.4
1.6										-1.6
1.8										-1.8
2						CLAY;, grey with orange-brown mottling (NATURAL).	D	ST	no odour, no staining.	-2
2.2										-2.2
2.4		0.0	BH15_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH16

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281231
Northing 6132208
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					PAVEMENT (FILL).			no odour, no staining.	
	HA	0.1	BH16_0.1-0.2 FD04 FS04			Gravelly SAND;, light brown (FILL).	SM		no odour, no staining.	
0.2										-0.2
						Sandy CLAY; (NATURAL).	SM		no odour, no staining, waste fragments.	
0.4		0.0	BH16_0.4-0.5 (2J)							-0.4
0.6										-0.6
	PT					Sandy CLAY; As above; red brown, moisture change (NATURAL).	D	ST	no odour, no staining.	
0.8										-0.8
1		0.0	BH16_1-1.1							-1
1.2						CLAY;, grey brown with trace orange mottling, slightly soft, stiffer past at 1.8 m (NATURAL).	D	ST	no odour, no staining.	-1.2
1.4										-1.4
1.6		0.0	BH16_1.6-1.7							-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4		0.0	BH16_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH17

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method HA
Total Depth (m) 0.55
Diameter (mm) 50

Easting 281280
Northing 6132217
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	HA					Sandy CLAY;, dark brown, trace OM (FILL).	M	S	no odour, no staining.	
		0.2	BH17_0.1-0.2			Sandy CLAY;, low plasticity, orange brown, trace rootlets (FILL).	M	S	no odour, no staining.	
0.2										-0.2
0.4		0.1	BH17_0.4-0.5			Gravelly SAND;, grey-brown (FILL).	D	L	no odour, no staining, grey/black material, suspected anthropogenic.	-0.4
0.6						Termination Depth at: 0.55 m. Target Depth Achieved.				-0.6
0.8										-0.8
1										-1
1.2										-1.2
1.4										-1.4
1.6										-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4										-2.4
2.6										-2.6

Notes Refusal on rock/gravel/hard surface

This log is not intended for geotechnical purposes.

Drilling Abbreviations

AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler

Moisture Abbreviations

D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations

Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense

Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-SOIL BORE

SOIL BORE BH18

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 05/08/2022 - 11/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method CC/HA/PT
Total Depth (m) 2.5
Diameter (mm) 50

Easting 281212
Northing 6132197
Grid Ref GDA94_MGA_zone_54
Elevation
Logged By MB
Checked By TD

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
	CC					CEMENT (FILL).			no odour, no staining.	
0.2	HA	0.1	BH18_0.2-0.3			Gravelly SAND;, orange brown to dark brown (FILL).	D	L	no odour, no staining.	-0.2
0.4						Sandy CLAY;, dark brown (NATURAL).	D		no odour, no staining.	-0.4
0.6		0.1	BH18_0.5-0.6							-0.6
0.8										-0.8
1		0.2	BH18_1-1.1							-1
1.2	PT					CLAY;, low plasticity, orange brown to pale brown (NATURAL).	D	ST	no odour, no staining.	-1.2
1.4										-1.4
1.6		0.2	BH18_1.6-1.7							-1.6
1.8										-1.8
2										-2
2.2										-2.2
2.4		0.2	BH18_2.4-2.5							-2.4
2.6						Termination Depth at: 2.50 m. Target Depth Achieved.				-2.6

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW01

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 04/08/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method
Total Depth (m) 15
Diameter (mm) 50

Easting, Northing 281146.719, 6132220.46
Grid Ref GDA94_MGA_zone_54
Elevation 45.906
Collar RL 45.82
Logged By SC, MB
Checked By TD

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC				MW01		CONCRETE.	D	L	pavement.	45
1	HA						Gravelly SAND, medium to coarse grained, poorly graded, angular to subangular, grey- brown mottled orange (FILL).	D	ST	no odour, no staining, some brick fragments.	44
2	SFA						Sandy CLAY, low plasticity, brown- grey (NATURAL - SOIL).			no odour, no staining.	43
3							CLAY, low to medium plasticity, grey-brown mottled orange (NATURAL - SOIL).	D	ST	no odour, no staining.	42
4					Grout						41
5											40
6											39
7											38
8					Bentonite						37
9							Sandy CLAY, low to medium plasticity, orange- brown mottled grey (NATURAL - SOIL).	M	F	no odour, no staining.	36
10											35
11											34
12					Sand						33
13							CLAY, medium plasticity, grey mottled orange- brown (NATURAL - SOIL).	M	ST	no odour, no staining.	32
14											31
15							Termination Depth at: 15.00 m. Target depth achieved.				30
16											29
17											28
18											27

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations

AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler

Moisture Abbreviations

D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations

Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense

Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW02

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 13/09/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method
Total Depth (m) 18
Diameter (mm) 50

Easting, Northing 280982.016, 6132307.966
Grid Ref GDA94_MGA_zone_54
Elevation 45.12
Collar RL -; 45.041
Logged By SC, MB
Checked By TD

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC				MW02		CONCRETE.			non-destructive digging via vacuum truck methodology..	45
1	NDD						CORE LOSS.				44
1.5	SFA						Sandy CLAY, low plasticity, orange-brown (NATURAL - SOIL).	D	F	no odour, no staining.	
2											43
3							CLAY, medium plasticity, grey- brown (NATURAL - SOIL).	SM	S	no odour, no staining.	42
4											41
5					Grout						40
6							Sandy CLAY, low to medium plasticity, brown- grey (NATURAL - SOIL).	SM	F	no odour, no staining.	39
7											38
8											37
9											36
10					Bentonite		CLAY, medium to high plasticity, brown-grey mottled red (NATURAL - SOIL).	M	F	no odour, no staining.	35
11											34
12											33
13											32
14					Sand		Sandy CLAY, low to medium plasticity, orange- brown mottled grey (NATURAL - SOIL).	M	ST	no odour, no staining.	31
15											30
16											29
17				▼							28
18							Termination Depth at: 18.00 m. Target depth achieved.				27

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW03

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 12/09/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method
Total Depth (m) 17.5
Diameter (mm) 50

Easting, Northing 281110.87, 6132303.036
Grid Ref GDA94_MGA_zone_54
Elevation 45.263
Collar RL -; 45.21
Logged By SC, MB
Checked By TD

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC				MW03		ASPHALT.			non-destructive digging via vacuum truck methodology..	45
1	NDD						CORE LOSS.				44
1.5	SFA						Sandy CLAY, low plasticity, grey- brown mottled orange (NATURAL - SOIL).	D	F	no odour, no staining.	
2											43
3							CLAY, medium plasticity, green mottled orange- brown, trace fine to medium sand (NATURAL - SOIL).	SM	ST	no odour, no staining.	42
4					Grout						41
5											40
6											39
7							Sandy CLAY, low plasticity, grey- brown mottled orange- red, trace fine to coarse gravel, fine to medium sand (NATURAL - SOIL).	M	ST	no odour, no staining.	38
8											37
9					Bentonite						36
10											35
11											34
12											33
13											32
14					Sand						31
15							Sandy CLAY, low plasticity, grey- brown, trace fine to medium gravel (NATURAL - SOIL).	W	F	no odour, no staining.	30
16											29
17											28
18							Termination Depth at: 17.50 m. Target depth achieved.				27

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW05

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 17/09/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method
Total Depth (m) 15
Diameter (mm) 50

Easting, Northing 281095.412, 6132169.869
Grid Ref GDA94_MGA_zone_54
Elevation 45.358
Collar RL -; 45.281
Logged By SC, MB
Checked By TD

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC				MW05		ASPHALT.			no recovery. non-destructive digging via vacuum truck methodology..	45
1	NDD						CORE LOSS.				44
1.5	SFA						Sandy CLAY, low to medium plasticity, red- brown mottled grey (NATURAL - SOIL).	D	F	no odour, no staining.	
2											43
3											42
4					Grout		CLAY, medium plasticity, grey- brown mottled orange (NATURAL - SOIL).	SM	F	no odour, no staining.	41
5											40
6											39
7											38
8											37
9					Bentonite						36
10											35
11							Gravelly CLAY, low plasticity, grey-brown, angular to subangular, fine to medium, poorly graded gravel (NATURAL - SOIL).	SM	F	no odour, no staining.	34
12					Sand		CLAY, medium plasticity, grey- brown mottled orange (NATURAL - SOIL).	M	ST	no odour, no staining.	33
13											32
14											31
15							Termination Depth at: 15.00 m. Target depth achieved.				30
16											29
17											28
18											27

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW06

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 16/09/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method
Total Depth (m) 14.5
Diameter (mm) 50

Easting, Northing 281237.719, 6132074.37
Grid Ref GDA94_MGA_zone_54
Elevation 46.48
Collar RL -; 46.39
Logged By SC, MB
Checked By TD

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC				MW06		ASPHALT.			non-destructive digging via vacuum truck methodology..	46
1	NDD						CORE LOSS.				
1.5	SFA										45
2							Sandy CLAY, low plasticity, orange-brown (NATURAL - SOIL).	D	F	no odour, no staining.	
3					Grout						44
4											43
5							CLAY, medium plasticity, pale brown mottled grey (NATURAL - SOIL).	M	F	no odour, no staining.	42
6											41
7					Bentonite						40
8											39
9											38
10							Sandy CLAY, low to medium plasticity, red- brown (NATURAL - SOIL).	VM	S	no odour, no staining.	37
11					Sand						36
12											35
13											34
14											33
15							Termination Depth at: 14.50 m. Target depth achieved.				32
16											31
17											30
18											29
											28

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations

AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler

Moisture Abbreviations

D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated

Consistency Abbreviations

Granular Soils VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense

Cohesive Soils VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

BOREHOLE LOG

ENVIRONMENTAL-GROUNDWATER

MONITORING WELL MW07

Client South Australian Metropolitan Fire Service
Project MFS Adelaide Fire Station SAQP & DSI
Project No. 12583428
Site Adelaide Fire Station
Location 99 Wakefield St, Adelaide 5000
Date Drilled 14/09/2022

Drill Co. WB Drilling Pty Ltd
Driller Ian Watt
Rig Type Eziprobe
Drill Method
Total Depth (m) 16
Diameter (mm) 50

Easting, Northing 281382.455, 6132228.308
Grid Ref GDA94_MGA_zone_54
Elevation 47.656
Collar RL -; 47.54
Logged By SC, MB
Checked By TD

B.C.L No. N/A **Casing** PVC (Class 18) **Screen** 0.5mm Slotted PVC (Class 18) **Surface Completion** Gatic

Depth (m)	Drilling Method	PID (ppm)	Sample ID	Water	Well Details	Graphic Log	LITHOLOGICAL DESCRIPTION Soil Type (Classification Group Symbol); Particle Size; Colour; Secondary / Minor Components.	Moisture	Consistency	COMMENTS/ CONTAMINANT INDICATORS Odours, staining, waste materials,separate phase liquids, imported fill, ash.	Elevation (m)
0	CC				MW07		ASPHALT.			non-destructive digging via vacuum truck methodology..	47
1	NDD						CORE LOSS.				
1.5	SFA						Sandy CLAY, low plasticity, grey- brown (NATURAL - SOIL).	D	F	no odour, no staining.	46
2											45
3							CLAY, medium plasticity, brown- grey mottled orange, trace fine to medium sand (NATURAL - SOIL).	M	ST	no odour, no staining.	
4					Grout						44
5											43
6											42
7											41
8											40
9					Bentonite						39
10											38
11							Sandy CLAY, low plasticity, red- brown (NATURAL - SOIL).	VM	S	no odour, no staining.	37
12							Sandy CLAY, low to medium plasticity, red- brown mottled grey (NATURAL - SOIL).	W	F	no odour, no staining.	36
13					Sand						35
14											34
15											33
16							Termination Depth at: 16.00 m. Target depth achieved.				32
17											31
18											30
											29

Notes

This log is not intended for geotechnical purposes.

Drilling Abbreviations	Moisture Abbreviations	Consistency Abbreviations	
AH-Air Hammer, AR-Air Rotary, BE-Bucket Excavation, CC-Concrete Coring, DC-Diamond Core, FH-Foam Hammer, HA-Hand Auger, HE-Hand Excavation (shovel), HFA-Hollow Flight Auger, NDD-Non Destructive Drilling, PT-Pushtube, SD-Sonic Drilling, SFA-Solid Flight Auger, SS-Split Spoon, WB-Wash Bore, WS-Window Sampler	D-Dry, SM-Slightly Moist, M-Moist, VM-Very Moist, W-Wet, S-Saturated	**Granular Soils** VL-Very Loose, L-Loose, MD-Medium Dense, D-Dense,VD - Very Dense	**Cohesive Soils** VS-Very Soft, S-Soft, F-Firm, ST-Stiff, VST-Very Stiff, H-Hard

Appendix G

Laboratory Reports

CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
✆ 02 9910 6200 | ✉ sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6800 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
✆ 07 3266 9532 | ✉ brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide Station PFAS DSI
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff, Vera Biermann	Envirolab Quote No. :
Sampler: Matt Bald	Date results required: 28/10/2022
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com ben.petticrew@ghd.com vera.biermann@ghd.com matt.bald@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	DAM_S	2 x 60 mL	21/10/2022	Water	x															
2	DAM_B	4 x 60 mL	21/10/2022	Water	x															
3	FD01	2 x 60 mL	21/10/2022	Water						x										
4	FS01	2 x 60 mL	21/10/2022	Water						x										
5	RB01	2 x 60 mL	21/10/2022	Water						x										Rinsate sample

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS Melb	*Lab Use Only*	
Print Name: Matt Bald	Print Name: L Olsen	Job number: 341609	Cooling: Ice / Ice pack / None
Date & Time: 21/10/2022; 1500	Date & Time: 24/10/22 8.00 am	Temperature: 16.1°C	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Company:	GHD	Client Project Name/Number/Site etc (ie report title):	12583428
Contact Person:	Matt Bald		
Project Mgr:		PO No. (if applicable):	
Sampler:		Envirolab Quote No. :	
Address:		Date results required: Or choose: ☐ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day	
Phone:	Mob:	*Note: Inform lab in advance if urgent turnaround is required - surcharges apply*	
Email Results to:		Additional report format: ☐ Esdat ☐ Equis	
Email Invoice to:		Lab Comments: Client COC to follow	

Sample information					Tests Required	Comments
Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample		Provide as much information about the sample as you can

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by	Client	Interstate Office	Laboratory	Lab Use Only	
Print Name:		ECS ADL Xspence	EJS Melb L Olsen	Job number: 341601	Office Cooling: Ice / Ice pack / None
Date & Time:		21/10/22 4.10pm	24/10/22 8.00am	Temp Office: 16.8 Temp Lab: 16.1°C	Lab Cooling: Ice / Ice pack / None
Signature:		KS	10.	TAT: SAME day / 1 / 2 / 3 / 4 / STD	Security seal: Intact / Broken / None

Sample Receipt Melbourne

From: Matt Bald <Matt.Bald@ghd.com>
Sent: Monday, 24 October 2022 10:38 AM
To: Sample Receipt Melbourne
Cc: Adelaide; Lucy Olsen; Alisha Purathattil; Ben Petticrew; Vera Biermann
Subject: RE: 12583428 Sample ID Discrepancies

Thanks Lucy.

Correct that there were four bottles provided for the DAM_B sample as listed on COC. You can take the volume required for analysis from any of them.

Any my mistake with the QC sample terminology on the COC. The bottle set labelled 'FD02' should be 'FS01' – could you please log it as FS01 on the SRA? Still hold for now.

Any additional information required, let me know.

Kind regards,
Matt

Matt Bald (he/him)
BSc (Hons)
Environmental Scientist

GHD
Proudly employee-owned | ghd.com
Level 4, 211 Victoria Square, Adelaide SA 5000, Australia
D +61 8 8111 6712 M +61 423 876 470 E matt.bald@ghd.com

From: Sample Receipt Melbourne <loginvic@envirolab.com.au>
Sent: Monday, 24 October 2022 10:00 AM
To: Ben Petticrew <Ben.Petticrew@ghd.com>; Vera Biermann <Vera.Biermann@ghd.com>; Matt Bald <Matt.Bald@ghd.com>
Cc: Adelaide <adelaide@envirolab.com.au>; Lucy Olsen <LOlsen@envirolab.com.au>; Alisha Purathattil <APurathattil@envirolab.com.au>
Subject: 12583428 Sample ID Discrepancies

Hi Matt, Ben & Vera,

We received the samples from project 12583428 (see COC attached) this morning.

We received two sets of PFAS bottles labelled 'DAM_B'.
We did not receive any bottles labelled 'FS01'.

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25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 34169

Client Details

Client	GHD SA
Attention	Vera Biermann
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428- MFS Adelaide Station PFAS DSI**
Number of Samples	5 Water
Date samples received	24/10/2022
Date completed instructions received	24/10/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	28/10/2022
Date of Issue	26/10/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Water Short			
Our Reference		34169-1	34169-2
Your Reference	UNITS	DAM_S	DAM_B
Date Sampled		21/10/2022	21/10/2022
Type of sample		Water	Water
Date prepared	-	25/10/2022	25/10/2022
Date analysed	-	25/10/2022	25/10/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	0.59	0.58
Perfluorooctanesulfonic acid PFOS	µg/L	1.8	1.8
Perfluorooctanoic acid PFOA	µg/L	0.07	0.07
6:2 FTS	µg/L	0.12	0.13
8:2 FTS	µg/L	0.06	0.06
Surrogate $^{13}C_8$ PFOS	%	98	97
Surrogate $^{13}C_2$ PFOA	%	104	102
Extracted ISTD $^{18}O_2$ PFHxS	%	94	93
Extracted ISTD $^{13}C_4$ PFOS	%	93	95
Extracted ISTD $^{13}C_4$ PFOA	%	94	96
Extracted ISTD $^{13}C_2$ 6:2FTS	%	91	91
Extracted ISTD $^{13}C_2$ 8:2FTS	%	108	92
Total Positive PFHxS & PFOS	µg/L	2.4	2.4
Total Positive PFOS & PFOA	µg/L	1.9	1.9
Total Positive PFAS	µg/L	2.6	2.6

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Water Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	109	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	115	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	108	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	109	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	111	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	103	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	95	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	96	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	105	[NT]	[NT]	[NT]	[NT]	101	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	103	[NT]	[NT]	[NT]	[NT]	92	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Vera Biermann

Sample Login Details

Your reference	12583428- MFS Adelaide Station PFAS DSI
Envirolab Reference	34169
Date Sample Received	24/10/2022
Date Instructions Received	24/10/2022
Date Results Expected to be Reported	28/10/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	5 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	16.1
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	PFAS in Water Short	On Hold
DAM_S	✓	
DAM_B	✓	
FD01		✓
FS02		✓
RB01		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2219291**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: VERA BIERMANN	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 03-Oct-2022 15:49
Order number	: ----	Date Analysis Commenced	: 04-Oct-2022
C-O-C number	: ----	Issue Date	: 07-Oct-2022 16:31
Sampler	: SC/CD		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FS01	----	----	----	----
				Sampling date / time	29-Sep-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2219291-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**1.38**	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		**2.29**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		**22.0**	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		**1.62**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**20.3**	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L		<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		**0.3**	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		**1.86**	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**10.7**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		**0.71**	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**1.08**	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L		**0.18**	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L		<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L		<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L		<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L		<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L		<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L		<0.05	----	----	----	----

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FS01	----	----	----	----
				Sampling date / time	29-Sep-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2219291-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L		<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L		<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L		<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.62**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		**63.0**	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**42.3**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**59.0**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**87.9**	----	----	----	----
13C8-PFOA	----	0.02	%		**103**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

QUALITY CONTROL REPORT

Work Order	: **EM2219291**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: VERA BIERMANN	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 03-Oct-2022
Order number	: ----	Date Analysis Commenced	: 04-Oct-2022
C-O-C number	: ----	Issue Date	: 07-Oct-2022
Sampler	: SC/CD		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4620084)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	82.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	90.5	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.25 µg/L	85.7	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	92.7	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.9	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	81.7	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4620084)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	97.0	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	92.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.3	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	94.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	86.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.3	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	103	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	119	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 4620084)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	112	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	108	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	99.4	70.0	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	92.8	70.0	130
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	93.4	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	96.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4620084)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	94.6	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	94.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	90.3	67.0	138

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4620084) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	77.8	70.0	130
EP231P: PFAS Sums (QCLot: 4620084)								
EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2219291**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: VERA BIERMANN	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 03-Oct-2022
Site	:	Issue Date	: 07-Oct-2022
Sampler	: SC/CD	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	16	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	16	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
FS01	**29-Sep-2022**	**06-Oct-2022**	28-Mar-2023	✓	**06-Oct-2022**	28-Mar-2023	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X)							
FS01	**29-Sep-2022**	**06-Oct-2022**	28-Mar-2023	✓	**06-Oct-2022**	28-Mar-2023	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X)							
FS01	**29-Sep-2022**	**06-Oct-2022**	28-Mar-2023	✓	**06-Oct-2022**	28-Mar-2023	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X)							
FS01	**29-Sep-2022**	**06-Oct-2022**	28-Mar-2023	✓	**06-Oct-2022**	28-Mar-2023	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X)							
FS01	**29-Sep-2022**	**06-Oct-2022**	28-Mar-2023	✓	**06-Oct-2022**	28-Mar-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	16	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	16	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2219291**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: VERA BIERMANN	Contact	: Peter Ravlic
Address	: Level 4, 211 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: vera.biermann@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12583428	Page	: 1 of 3
Order number	: ----	Quote number	: EB2020GHDSER0038 (EN/005)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: SC/CD		

Dates

Date Samples Received	: 03-Oct-2022 15:49	Issue Date	: 03-Oct-2022
Client Requested Due Date	: 10-Oct-2022	Scheduled Reporting Date	: **10-Oct-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 15.55°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample(s) received in non-ALS container(s).**
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EM2219291-001	29-Sep-2022 00:00	FS01	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com

BEN PETTICREW

- *AU Certificate of Analysis - NATA (COA)	Email	ben.petticrew@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ben.petticrew@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ben.petticrew@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ben.petticrew@ghd.com
- Chain of Custody (CoC) (COC)	Email	ben.petticrew@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ben.petticrew@ghd.com
- EDI Format - XTab (XTAB)	Email	ben.petticrew@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ben.petticrew@ghd.com

GHD LAB REPORTS

- *AU Certificate of Analysis - NATA (COA)	Email	ghdlabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ghdlabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ghdlabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ghdlabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ghdlabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ghdlabreports@ghd.com

STEVEN CASTILLO

- *AU Certificate of Analysis - NATA (COA)	Email	steven.castillo@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	steven.castillo@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	steven.castillo@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	steven.castillo@ghd.com
- Chain of Custody (CoC) (COC)	Email	steven.castillo@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	steven.castillo@ghd.com
- EDI Format - XTab (XTAB)	Email	steven.castillo@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	steven.castillo@ghd.com

VERA BIERMANN

- *AU Certificate of Analysis - NATA (COA)	Email	vera.biermann@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	vera.biermann@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	vera.biermann@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	vera.biermann@ghd.com
- A4 - AU Tax Invoice (INV)	Email	vera.biermann@ghd.com
- Chain of Custody (CoC) (COC)	Email	vera.biermann@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	vera.biermann@ghd.com
- EDI Format - XTab (XTAB)	Email	vera.biermann@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	vera.biermann@ghd.com

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): KS ELS 3/9/22 12583428 - MFS Adelaide DSI ~~- Waste Disposal~~ Groundwater Monitoring Event
Contact Person: Steven Castillo	
Project Mgr: Vera Biermann	PO No.:
Sampler: Steven Castillo, Chelsie Davies	Envirolab Quote No.:
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6832 Mob: 0408 004 659	Additional report format: esdat
Email: GHDLabReports@ghd.com, ben.petticrew@ghd.com, steven.castillo@ghd.com, vera.biermann@ghd.com	Lab Comments:

Environmental Division Melbourne
Work Order Reference
EM2219291

Telephone : +61-3-8549 9600

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)	PFAS (Long)													
	MW03	2B (250ml)	9/29/2022	Water		X													
	MW06	2B (250ml)	9/29/2022	Water		X													
	MW07	2B (250ml)	9/29/2022	Water		X													
	GW101	2B (60ml)	9/29/2022	Water		X													
	GW102	2B (60ml)	9/29/2022	Water	X														
	GW104	2B (60ml)	9/29/2022	Water	X														
	GW106	2B (60ml)	9/29/2022	Water	X														
	FD01	2B (60ml)	9/29/2022	Water		X													
(1)	FS01	2B (60ml)	9/29/2022	Water		X													Please forward to ALS
	RB01	2B (60ml)	9/29/2022	Water	X														

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Steven Castillo (GHD)	Received by (Company): ELS Adelaide	Lab Use Only	
Print Name: Steven Castillo	Print Name: Alex Stanic	Job number: ~~12583428~~ KS ELS 3/9/22	Cooling: Ice / Ice pack / None
Date & Time: 30/09/2022	Date & Time: 30/9/22 @ 1pm	Temperature:	Security seal: Intact / Broken / None
Signature:	Signature: 6.2°C ice.	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Relinquished by ELS Melb CR 3/10/22
received Oliver (ALS) 3/10/22 16:19

CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
✆ 02 9910 6200 | ✉ sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6800 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): VS ELS 29/9/22
Contact Person: Steven Castillo	12583428 - MFS Adelaide DSI ~~- Waste Disposal~~ Groundwater Monitoring Event
Project Mgr: Vera Biermann	PO No.:
Sampler: Steven Castillo, Chelsie Davies	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6832 Mob: 0408 004 659	Additional report format: esdat
Email: GHDLabReports@ghd.com ben.petticrew@ghd.com steven.castillo@ghd.com vera.biermann@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)	PFAS (Long)														Provide as much information about the sample as you can
1	MW03	2B (250ml)	9/29/2022	Water		X														
2	MW06	2B (250ml)	9/29/2022	Water		X														
3	MW07	2B (250ml)	9/29/2022	Water		X														
4	GW101	2B (60ml)	9/29/2022	Water		X														
5	GW102	2B (60ml)	9/29/2022	Water	X															
6	GW104	2B (60ml)	9/29/2022	Water	X															
7	GW106	2B (60ml)	9/29/2022	Water	X															
8	FD01	2B (60ml)	9/29/2022	Water		X														
—	FS01	2B (60ml)	9/29/2022	Water		X														Please forward to ALS
9	RB01	2B (60ml)	9/29/2022	Water	X															

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Steven Castillo (GHD)	Received by (Company): ELS Adelaide/ELS Melb		*Lab Use Only*
Print Name: Steven Castillo	Print Name: Alex Stanton	AP	Job number: ~~12583428~~ 33831 VS ELS 30/9/22
Date & Time:30/09/2022	Date & Time: 30/9/22 @ 1pm	3/10/22	Temperature: 12.8
Signature:	Signature: 6.2°C ice.	7am	Cooling: Ice / Ice pack / None Security seal: Intact / Broken / None TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

Karley Spence

From: Steven Castillo <Steven.Castillo@ghd.com>
Sent: Friday, 30 September 2022 3:58 PM
To: Alex Stenta; Chelsie Davies
Cc: Adelaide
Subject: RE: Job Number 12583428 - Waters

Hi Alex,

I confirmed with Ben and the COC should be correct – we are actually after **PFAS (long)** and **not PFAS (trace)** level. Apologies for the confusion!

Just a minor edit to the COC however, under report title – are we able to please change 'Waste Disposal' to 'Groundwater Monitoring Event'?

Thanks so much and have a great long weekend!

Regards,

Steven Castillo (he/him)
BSc (Hons) Environmental Science
Graduate Environmental Scientist

GHD
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D +61 8 8111 6832 **M** +61 408 004 659 **E** steven.castillo@ghd.com

From: Alex Stenta <astenta@envirolab.com.au>
Sent: Friday, September 30, 2022 3:35 PM
To: Steven Castillo <Steven.Castillo@ghd.com>; Chelsie Davies <Chelsie.Davies@ghd.com>
Cc: Adelaide <adelaide@envirolab.com.au>
Subject: Job Number 12583428 - Waters

Hi Steven,

Hope you've had a great afternoon!

Are you able to confirm if the analysis for the Water samples is supposed to be **PFAS Trace level** instead of **PFAS (long)** as per Ben's previous email?

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33831

Client Details

Client	GHD SA
Attention	Vera Biermann
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428- Groundwater Monitoring Event**
Number of Samples	9 Water
Date samples received	03/10/2022
Date completed instructions received	03/10/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	10/10/2022
Date of Issue	04/10/2022

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Results Approved By
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Water Short					
Our Reference		33831-5	33831-6	33831-7	33831-9
Your Reference	UNITS	GW102	GW104	GW106	RB01
Date Sampled		29/09/2022	29/09/2022	29/09/2022	29/09/2022
Type of sample		Water	Water	Water	Water
Date prepared	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Date analysed	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	<0.01	<0.01	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01	<0.01	0.02	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	<0.01	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	101	92	95	94
Surrogate $^{13}C_2$ PFOA	%	101	104	102	101
Extracted ISTD $^{18}O_2$ *PFHxS*	%	93	94	96	94
Extracted ISTD $^{13}C_4$ *PFOS*	%	99	96	100	98
Extracted ISTD $^{13}C_4$ *PFOA*	%	101	94	98	98
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	103	88	92	100
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	108	95	95	103
Total Positive PFHxS & PFOS	µg/L	<0.01	<0.01	0.02	<0.01
Total Positive PFOS & PFOA	µg/L	<0.01	<0.01	0.02	<0.01
Total Positive PFAS	µg/L	<0.01	<0.01	0.02	<0.01

PFAS in Waters Extended						
Our Reference		33831-1	33831-2	33831-3	33831-4	33831-8
Your Reference	UNITS	MW03	MW06	MW07	GW101	FD01
Date Sampled		29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Date analysed	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Perfluorobutanesulfonic acid	µg/L	0.07	<0.01	<0.01	1.7	1.8
Perfluoropentanesulfonic acid	µg/L	0.03	<0.01	<0.01	2.1	2.2
Perfluorohexanesulfonic acid PFHxS	µg/L	0.30	<0.01	<0.01	20	19
Perfluoroheptanesulfonic acid	µg/L	0.02	<0.01	<0.01	1.4	1.5
Perfluorooctanesulfonic acid PFOS	µg/L	0.06	<0.01	<0.01	22	21
Perfluorodecanesulfonic acid	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorobutanoic acid	µg/L	0.07	<0.02	<0.02	0.99	0.97
Perfluoropentanoic acid	µg/L	<0.02	<0.02	<0.02	1.8	1.8
Perfluorohexanoic acid	µg/L	0.04	<0.01	<0.01	9.2	8.9
Perfluoroheptanoic acid	µg/L	<0.01	<0.01	<0.01	0.79	0.80
Perfluorooctanoic acid PFOA	µg/L	0.01	<0.01	<0.01	1.5	1.5
Perfluorononanoic acid	µg/L	<0.01	<0.01	<0.01	0.19	0.19
Perfluorodecanoic acid	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Perfluorotridecanoic acid	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorotetradecanoic acid	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
4:2 FTS	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
6:2 FTS	µg/L	0.02	0.02	0.05	0.67	0.73
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
10:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonamide	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctanesulfon -amide	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
N-Me perfluorooctanesulfonamid -oethanol	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Et perfluorooctanesulfonamid -oethanol	µg/L	<0.5	<0.5	<0.5	<0.5	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	94	97	100	95	98
Surrogate $^{13}C_2$ PFOA	%	100	101	99	101	102
Extracted ISTD $^{13}C_3$ *PFBS*	%	96	98	93	93	92
Extracted ISTD $^{18}O_2$ *PFHxS*	%	90	94	96	93	101
Extracted ISTD $^{13}C_4$ *PFOS*	%	96	98	97	99	104
Extracted ISTD $^{13}C_4$ *PFBA*	%	97	94	96	98	99

PFAS in Waters Extended						
Our Reference		33831-1	33831-2	33831-3	33831-4	33831-8
Your Reference	UNITS	MW03	MW06	MW07	GW101	FD01
Date Sampled		29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Type of sample		Water	Water	Water	Water	Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	99	96	99	96	97
Extracted ISTD $^{13}C_2$ *PFHxA*	%	94	95	95	85	86
Extracted ISTD $^{13}C_4$ *PFHpA*	%	94	97	98	88	84
Extracted ISTD $^{13}C_4$ *PFOA*	%	97	98	100	97	96
Extracted ISTD $^{13}C_5$ *PFNA*	%	99	98	103	87	89
Extracted ISTD $^{13}C_2$ *PFDA*	%	97	96	98	97	100
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	101	100	99	101	98
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	101	101	99	105	106
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	92	92	86	93	89
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	95	97	92	92	92
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	96	98	98	93	91
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	104	94	104	99	108
Extracted ISTD $^{13}C_8$ *FOSA*	%	105	107	109	110	108
Extracted ISTD d_3 *N MeFOSA*	%	99	99	98	99	98
Extracted ISTD d_5 *NEtFOSA*	%	96	97	94	102	103
Extracted ISTD d_7 *N MeFOSE*	%	97	96	91	94	91
Extracted ISTD d_9 *N EtFOSE*	%	94	92	91	94	100
Extracted ISTD d_3 *N MeFOSAA*	%	98	99	97	109	112
Extracted ISTD d_5 *N EtFOSAA*	%	100	102	103	99	101
Total Positive PFHxS & PFOS	µg/L	0.35	<0.01	<0.01	41	40
Total Positive PFOS & PFOA	µg/L	0.07	<0.01	<0.01	23	23
Total Positive PFAS	µg/L	0.63	0.02	0.05	62	60

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Water Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	9	<0.01	<0.01	0	119	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	9	<0.01	<0.01	0	113	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	9	<0.01	<0.01	0	113	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	9	<0.01	<0.01	0	120	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	9	<0.02	<0.02	0	124	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	104	9	94	100	6	106	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	99	9	101	99	2	96	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	89	9	94	94	0	90	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	91	9	98	100	2	90	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	95	9	98	99	1	97	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	88	9	100	95	5	89	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	94	9	103	101	2	90	[NT]

QUALITY CONTROL: PFAS in Waters Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorobutanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	114	[NT]
Perfluoropentanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	120	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	119	[NT]
Perfluoroheptanesulfonic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	123	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	113	[NT]
Perfluorodecanesulfonic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	115	[NT]
Perfluorobutanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	120	[NT]
Perfluoropentanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	115	[NT]
Perfluorohexanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	115	[NT]
Perfluoroheptanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	113	[NT]
Perfluorononanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	108	[NT]
Perfluorodecanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	117	[NT]
Perfluoroundecanoic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	119	[NT]
Perfluorododecanoic acid	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	111	[NT]
Perfluorotridecanoic acid	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
Perfluorotetradecanoic acid	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	114	[NT]
4:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	119	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	120	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	124	[NT]
10:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	120	[NT]
Perfluorooctane sulfonamide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	114	[NT]
N-Ethyl perfluorooctanesulfon -amide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	109	[NT]
N-Me perfluorooctanesulfonamid -oethanol	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	108	[NT]
N-Et perfluorooctanesulfonamid -oethanol	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	115	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	107	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	118	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	106	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	96	[NT]
Extracted ISTD $^{13}C_3$ PFBS	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	91	[NT]

QUALITY CONTROL: PFAS in Waters Extended						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	89	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	92	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	93	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	96	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	74	[NT]	[NT]	[NT]	[NT]	75	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	88	[NT]	[NT]	[NT]	[NT]	89	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	95	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	91	[NT]
Extracted ISTD d_5 *NEtFOSA*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	86	[NT]	[NT]	[NT]	[NT]	91	[NT]
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	92	[NT]

QUALITY CONTROL: PFAS in Waters Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	91	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Envirolab Services Pty Ltd
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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Vera Biermann

Sample Login Details

Your reference	12583428- Groundwater Monitoring Event
Envirolab Reference	33831
Date Sample Received	03/10/2022
Date Instructions Received	03/10/2022
Date Results Expected to be Reported	10/10/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	9 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	12.8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
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Sample ID	PFAS in Water Short	PFAS in Waters Extended
MW03		✓
MW06		✓
MW07		✓
GW101		✓
GW102	✓	
GW104	✓	
GW106	✓	
FD01		✓
RB01	✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

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CERTIFICATE OF ANALYSIS 307356

Client Details

Client	GHD Pty Ltd
Attention	Ben Petticrew
Address	GPO Box 2052, Adelaide, SA, 5001

Sample Details

Your Reference	**MFS Adelaide**
Number of Samples	7 Water
Date samples received	06/10/2022
Date completed instructions received	06/10/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	13/10/2022
Date of Issue	12/10/2022

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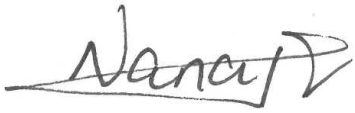
Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Alexander Mitchell Maclean, Senior Chemist
Phalak Inthakesone, Organics Development Manager, Sydney

Authorised By



Nancy Zhang, Laboratory Manager

PFAS in Waters Short						
Our Reference		307356-1	307356-2	307356-4	307356-5	307356-6
Your Reference	UNITS	MW01	MW05	GW103	GW105	FD01
Date Sampled		05/10/2022	05/10/2022	05/10/2022	05/10/2022	05/10/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	07/10/2022	07/10/2022	07/10/2022	07/10/2022	07/10/2022
Date analysed	-	07/10/2022	07/10/2022	07/10/2022	07/10/2022	07/10/2022
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.18	0.09	4.8	<0.01	0.09
Perfluorooctanesulfonic acid PFOS	µg/L	1.5	<0.01	9.4	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	0.03	<0.01	0.41	<0.01	<0.01
6:2 FTS	µg/L	0.08	<0.01	0.72	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	96	97	99	98	102
Surrogate $^{13}C_2$ *PFOA*	%	107	103	102	102	104
Extracted ISTD $^{18}O_2$ *PFHxS*	%	103	105	98	105	101
Extracted ISTD $^{13}C_4$ *PFOS*	%	98	98	91	100	97
Extracted ISTD $^{13}C_4$ *PFOA*	%	97	93	95	97	96
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	87	81	85	93	80
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	120	94	112	118	102
Total Positive PFHxS & PFOS	µg/L	1.6	0.09	14	<0.01	0.09
Total Positive PFOA & PFOS	µg/L	1.5	<0.01	9.9	<0.01	<0.01
Total Positive PFAS	µg/L	1.8	0.09	15	<0.01	0.09

PFAS in Waters Short		
Our Reference		307356-7
Your Reference	UNITS	RB01
Date Sampled		05/10/2022
Type of sample		Water
Date prepared	-	07/10/2022
Date analysed	-	07/10/2022
Perfluorohexanesulfonic acid - PFHxS	µg/L	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01
6:2 FTS	µg/L	<0.01
8:2 FTS	µg/L	<0.02
Surrogate $^{13}C_8$ *PFOS*	%	98
Surrogate $^{13}C_2$ *PFOA*	%	94
Extracted ISTD $^{18}O_2$ *PFHxS*	%	106
Extracted ISTD $^{13}C_4$ *PFOS*	%	102
Extracted ISTD $^{13}C_4$ *PFOA*	%	109
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	113
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	139
Total Positive PFHxS & PFOS	µg/L	<0.01
Total Positive PFOA & PFOS	µg/L	<0.01
Total Positive PFAS	µg/L	<0.01

PFAS in Waters Trace Extended		
Our Reference		307356-3
Your Reference	UNITS	MW02
Date Sampled		05/10/2022
Type of sample		Water
Date prepared	-	11/10/2022
Date analysed	-	11/10/2022
Perfluorobutanesulfonic acid	µg/L	0.002
Perfluoropentanesulfonic acid	µg/L	<0.001
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0062
Perfluoroheptanesulfonic acid	µg/L	<0.001
Perfluorooctanesulfonic acid PFOS	µg/L	0.024
Perfluorodecanesulfonic acid	µg/L	<0.002
Perfluorobutanoic acid	µg/L	<0.02
Perfluoropentanoic acid	µg/L	<0.002
Perfluorohexanoic acid	µg/L	0.0045
Perfluoroheptanoic acid	µg/L	0.004
Perfluorooctanoic acid PFOA	µg/L	0.020
Perfluorononanoic acid	µg/L	0.001
Perfluorodecanoic acid	µg/L	<0.002
Perfluoroundecanoic acid	µg/L	<0.002
Perfluorododecanoic acid	µg/L	<0.005
Perfluorotridecanoic acid	µg/L	<0.01
Perfluorotetradecanoic acid	µg/L	<0.05
4:2 FTS	µg/L	<0.001
6:2 FTS	µg/L	0.020
8:2 FTS	µg/L	<0.0004
10:2 FTS	µg/L	<0.002
Perfluorooctane sulfonamide	µg/L	<0.02
N-Methyl perfluorooctane sulfonamide	µg/L	<0.05
N-Ethyl perfluorooctanesulfon amide	µg/L	<0.1
N-Me perfluorooctanesulfonamid oethanol	µg/L	<0.05
N-Et perfluorooctanesulfonamid oethanol	µg/L	<0.5
MePerfluorooctanesulf- amid oacetic acid	µg/L	<0.004
EtPerfluorooctanesulf- amid oacetic acid	µg/L	<0.002
Surrogate $^{13}C_8$ *PFOS*	%	100
Surrogate $^{13}C_2$ *PFOA*	%	111
Extracted ISTD $^{13}C_3$ *PFBS*	%	92
Extracted ISTD $^{18}O_2$ *PFHxS*	%	90
Extracted ISTD $^{13}C_4$ *PFOS*	%	101
Extracted ISTD $^{13}C_4$ *PFBA*	%	#

PFAS in Waters Trace Extended		
Our Reference		307356-3
Your Reference	UNITS	MW02
Date Sampled		05/10/2022
Type of sample		Water
Extracted ISTD $^{13}C_3$ *PFPeA*	%	44
Extracted ISTD $^{13}C_2$ *PFHxA*	%	63
Extracted ISTD $^{13}C_4$ *PFHpA*	%	98
Extracted ISTD $^{13}C_4$ *PFOA*	%	110
Extracted ISTD $^{13}C_5$ *PFNA*	%	111
Extracted ISTD $^{13}C_2$ *PFDA*	%	108
Extracted ISTD $^{13}C_2$ *PFUnDA*	%	90
Extracted ISTD $^{13}C_2$ *PFDoDA*	%	83
Extracted ISTD $^{13}C_2$ *PFTeDA*	%	101
Extracted ISTD $^{13}C_2$ *4:2FTS*	%	167
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	167
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	#
Extracted ISTD $^{13}C_8$ *FOSA*	%	32
Extracted ISTD d_3 *N MeFOSA*	%	104
Extracted ISTD d_5 *N EtFOSA*	%	111
Extracted ISTD d_7 *N MeFOSE*	%	106
Extracted ISTD d_9 *N EtFOSE*	%	102
Extracted ISTD d_3 *N MeFOSAA*	%	31
Extracted ISTD d_5 *N EtFOSAA*	%	90
Total Positive PFHxS & PFOS	µg/L	0.030
Total Positive PFOS & PFOA	µg/L	0.044
Total Positive PFAS	µg/L	0.083

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLPs/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER.

QUALITY CONTROL: PFAS in Waters Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	307356-1
Date prepared	-			07/10/2022	[NT]	[NT]	[NT]	[NT]	07/10/2022	07/10/2022
Date analysed	-			07/10/2022	[NT]	[NT]	[NT]	[NT]	07/10/2022	07/10/2022
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	100	103
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	100	114
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	104	105
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	105	111
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	101	111
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	98	99
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	102	101
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	96	97
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	98	94
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	99	96
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	115	[NT]	[NT]	[NT]	[NT]	108	84
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	135	[NT]	[NT]	[NT]	[NT]	127	109

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	
Date prepared	-			11/10/2022	[NT]	[NT]	[NT]	[NT]	11/10/2022	[NT]
Date analysed	-			11/10/2022	[NT]	[NT]	[NT]	[NT]	11/10/2022	[NT]
Perfluorobutanesulfonic acid	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluoropentanesulfonic acid	µg/L	0.001	Org-029	<0.001	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluorohexanesulfonic acid - PFHxS	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	92	[NT]
Perfluoroheptanesulfonic acid	µg/L	0.001	Org-029	<0.001	[NT]	[NT]	[NT]	[NT]	93	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	108	[NT]
Perfluorodecanesulfonic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	75	[NT]
Perfluorobutanoic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	98	[NT]
Perfluoropentanoic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	101	[NT]
Perfluorohexanoic acid	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	98	[NT]
Perfluoroheptanoic acid	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.0002	Org-029	<0.0002	[NT]	[NT]	[NT]	[NT]	97	[NT]
Perfluorononanoic acid	µg/L	0.001	Org-029	<0.001	[NT]	[NT]	[NT]	[NT]	105	[NT]
Perfluorodecanoic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	98	[NT]
Perfluoroundecanoic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	99	[NT]
Perfluorododecanoic acid	µg/L	0.005	Org-029	<0.005	[NT]	[NT]	[NT]	[NT]	95	[NT]
Perfluorotridecanoic acid	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	79	[NT]
Perfluorotetradecanoic acid	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	106	[NT]
4:2 FTS	µg/L	0.001	Org-029	<0.001	[NT]	[NT]	[NT]	[NT]	98	[NT]
6:2 FTS	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	97	[NT]
8:2 FTS	µg/L	0.0004	Org-029	<0.0004	[NT]	[NT]	[NT]	[NT]	84	[NT]
10:2 FTS	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	114	[NT]
Perfluorooctane sulfonamide	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	99	[NT]
N-Methyl perfluorooctane sulfonamide	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	105	[NT]
N-Ethyl perfluorooctanesulfon amide	µg/L	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
N-Me perfluorooctanesulfonamid oethanol	µg/L	0.05	Org-029	<0.05	[NT]	[NT]	[NT]	[NT]	107	[NT]
N-Et perfluorooctanesulfonamid oethanol	µg/L	0.5	Org-029	<0.5	[NT]	[NT]	[NT]	[NT]	107	[NT]
MePerfluorooctanesulf- amid oacetic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	98	[NT]
EtPerfluorooctanesulf- amid oacetic acid	µg/L	0.002	Org-029	<0.002	[NT]	[NT]	[NT]	[NT]	91	[NT]
Surrogate $^{13}C_8$ *PFOS*	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	106	[NT]
Surrogate $^{13}C_2$ *PFOA*	%		Org-029	97	[NT]	[NT]	[NT]	[NT]	101	[NT]

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	
Extracted ISTD $^{13}C_3$ *PFBS*	%		Org-029	58	[NT]	[NT]	[NT]	[NT]	87	[NT]
Extracted ISTD $^{18}O_2$ *PFHxS*	%		Org-029	59	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_4$ *PFOS*	%		Org-029	57	[NT]	[NT]	[NT]	[NT]	79	[NT]
Extracted ISTD $^{13}C_4$ *PFBA*	%		Org-029	65	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{13}C_3$ *PFPeA*	%		Org-029	58	[NT]	[NT]	[NT]	[NT]	84	[NT]
Extracted ISTD $^{13}C_2$ *PFHxA*	%		Org-029	62	[NT]	[NT]	[NT]	[NT]	95	[NT]
Extracted ISTD $^{13}C_4$ *PFHpA*	%		Org-029	64	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_4$ *PFOA*	%		Org-029	65	[NT]	[NT]	[NT]	[NT]	101	[NT]
Extracted ISTD $^{13}C_5$ *PFNA*	%		Org-029	65	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD $^{13}C_2$ *PFDA*	%		Org-029	62	[NT]	[NT]	[NT]	[NT]	97	[NT]
Extracted ISTD $^{13}C_2$ *PFUnDA*	%		Org-029	63	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{13}C_2$ *PFDoDA*	%		Org-029	55	[NT]	[NT]	[NT]	[NT]	106	[NT]
Extracted ISTD $^{13}C_2$ *PFTeDA*	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	59	[NT]
Extracted ISTD $^{13}C_2$ *4:2FTS*	%		Org-029	67	[NT]	[NT]	[NT]	[NT]	116	[NT]
Extracted ISTD $^{13}C_2$ *6:2FTS*	%		Org-029	76	[NT]	[NT]	[NT]	[NT]	132	[NT]
Extracted ISTD $^{13}C_2$ *8:2FTS*	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	139	[NT]
Extracted ISTD $^{13}C_8$ *FOSA*	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	73	[NT]
Extracted ISTD d_3 *N MeFOSA*	%		Org-029	105	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD d_5 *N EtFOSA*	%		Org-029	106	[NT]	[NT]	[NT]	[NT]	103	[NT]
Extracted ISTD d_7 *N MeFOSE*	%		Org-029	103	[NT]	[NT]	[NT]	[NT]	104	[NT]

QUALITY CONTROL: PFAS in Waters Trace Extended					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-W1	
Extracted ISTD d_9 *N EtFOSE*	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	100	[NT]
Extracted ISTD d_3 *N MeFOSAA*	%		Org-029	67	[NT]	[NT]	[NT]	[NT]	108	[NT]
Extracted ISTD d_5 *N EtFOSAA*	%		Org-029	71	[NT]	[NT]	[NT]	[NT]	136	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

CHAIN OF CUSTODY FORM - Client

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08 8967 1201 | darwin@envirolab.com.au

Company:	GHD	Client Project Name/Number/Site etc (ie report title):	MFS Adelaide
Contact Person:	Ben Petticrew	PO No. (if applicable):	
Project Mgr:	~~Ben Petticrew~~ Vera Biermann	Envirolab Quote No. :	
Sampler:	Ben Petticrew / Chelsie Davies	Date results required:	☑ Standard ☐ Same Day ☐ 1 day ☐ 2 day ☐ 3 day
Address:	Level 9, 211 Victoria Square, Adelaide, 5000	Or choose:	
Phone:	Mob: 0460830524	Note: Inform lab in advance if urgent turnaround is required - surcharges apply	
Email Results to:	Ben.Petticrew@GHD.COM	Additional report format:	☑ Esdat ☐ Equis
Email Invoice to:	Ben.Petticrew@GHD.com	Lab Comments:	

Sample information					Tests Required			Comments
Envirolab Sample ID (Lab use only)	Client Sample ID or Information	Depth	Date Sampled	Type of Sample	PFAS Short	PFAS Long		Provide as much information about the sample as you can
1	MW07		5/10/22	water	✓			
2	MW05		5/10/22	water	✓			
3	MW02		5/10/22	water		✓		
4	GW103		5/10/22	water	✓			
5	GW105		5/10/22	water	✓			
6	FD01		5/10/22	water	✓			
7	RB01		5/10/22	water	✓			

☐ *Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis*

Relinquished by	Client	Interstate Office	Laboratory	Lab Use Only
Print Name:	Chelsie Davies	ECS ADL KSpence	ELS JM	Job number: 307556
Date & Time:	5/10/22 1-10pm	5/10/22 1-10pm	6/10/22	Temp Office: 21.0 Temp Lab: 10
Signature:	CDavies	KS		TAT: SAME day / 1 / 2 / 3 / 4 / STD
				Office Cooling: Ice / Ice pack / None
				Lab Cooling: Ice / Ice pack / None
				Security seal: Intact / Broken / None

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	GHD Pty Ltd
Attention	Ben Petticrew

Sample Login Details

Your reference	MFS Adelaide
Envirolab Reference	307356
Date Sample Received	06/10/2022
Date Instructions Received	06/10/2022
Date Results Expected to be Reported	13/10/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	7 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	10
Cooling Method	Ice
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	**Phone: 02 9910 6200**
Fax: 02 9910 6201	**Fax: 02 9910 6201**
Email: ahie@envirolab.com.au	**Email: jhurst@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
customerservice@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Waters Short	PFAS in Waters Extended
MW01	✓	
MW05	✓	
MW02		✓
GW103	✓	
GW105	✓	
FD01	✓	
RB01	✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.
TAT for Micro is dependent on incubation. This varies from 3 to 6 days.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2215770**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 17-Aug-2022 16:05
Order number	: ----	Date Analysis Commenced	: 18-Aug-2022
C-O-C number	: ----	Issue Date	: 22-Aug-2022 12:52
Sampler	: MB/AK		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	FS06	----	----	----	----
				Sampling date / time	12-Aug-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2215770-001	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**37.2**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		**0.0002**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0011**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0177**	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0004**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		**0.0006**	----	----	----	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0188**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0194**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**95.0**	----	----	----	----
13C8-PFOA	----	0.0002	%		**102**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SEDIMENT**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2215770**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 17-Aug-2022
Order number	: ----	Date Analysis Commenced	: 18-Aug-2022
C-O-C number	: ----	Issue Date	: 22-Aug-2022
Sampler	: MB/AK		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
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ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4526352)									
EM2215775-001	Anonymous	EA055: Moisture Content	----	0.1	%	14.2	13.0	8.8	0% - 20%
EM2215775-022	Anonymous	EA055: Moisture Content	----	0.1	%	18.1	17.5	3.7	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4525805)									
EM2215678-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2215678-023	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0004	0.0004	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4525805)									
EM2215678-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EM2215678-023	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4525805)									
EM2215678-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4525805) - continued									
EM2215678-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2215678-023	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 4525805)									
EM2215678-001	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2215678-023	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0004	0.0004	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0004	0.0004	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4525805)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	103	72.0	128
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.0014 mg/kg	77.2	67.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	98.6	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4525805)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	94.2	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	99.8	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.4	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4525805)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	102	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	100	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	112	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	93.0	70.0	130
EP231P: PFAS Sums (QCLot: 4525805)								
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4525805)							
EM2215678-013	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	106	72.0	128
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	91.7	67.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	82.2	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4525805)							
EM2215678-013	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	85.7	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	93.3	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	89.1	70.0	132

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4525805) - continued							
EM2215678-013	Anonymous	EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	87.2	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	85.4	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4525805)							
EM2215678-013	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	86.5	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	95.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	95.4	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	82.2	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2215770**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 17-Aug-2022
Site	:	Issue Date	: 22-Aug-2022
Sampler	: MB/AK	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055)							
FS06	**12-Aug-2022**	**----**	----	----	**18-Aug-2022**	26-Aug-2022	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
FS06	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	27-Sep-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
FS06	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	27-Sep-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
FS06	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	27-Sep-2022	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
FS06	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	27-Sep-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2215770**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: dilara.valiff@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12583428	Page	: 1 of 3
Order number	: ----	Quote number	: EB2020GHDSER0038 (EN/005)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: MB/AK		

Dates

Date Samples Received	: 17-Aug-2022 16:05	Issue Date	: 17-Aug-2022
Client Requested Due Date	: 24-Aug-2022	Scheduled Reporting Date	: **24-Aug-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 15.6°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample(s) received in non-ALS container(s).**
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - EP231 (solids) PFAS - Short Suite (12 analytes)
EM2215770-001	12-Aug-2022 00:00	FS06	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com

ALLY KIRKMAN

- *AU Certificate of Analysis - NATA (COA)	Email	ally.kirkman@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ally.kirkman@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ally.kirkman@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ally.kirkman@ghd.com
- Chain of Custody (CoC) (COC)	Email	ally.kirkman@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ally.kirkman@ghd.com
- EDI Format - XTab (XTAB)	Email	ally.kirkman@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ally.kirkman@ghd.com

DILARA VALIFF

- *AU Certificate of Analysis - NATA (COA)	Email	dilara.valiff@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	dilara.valiff@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	dilara.valiff@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	dilara.valiff@ghd.com
- A4 - AU Tax Invoice (INV)	Email	dilara.valiff@ghd.com
- Chain of Custody (CoC) (COC)	Email	dilara.valiff@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	dilara.valiff@ghd.com
- EDI Format - XTab (XTAB)	Email	dilara.valiff@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	dilara.valiff@ghd.com

GHD LAB REPORTS

- *AU Certificate of Analysis - NATA (COA)	Email	ghdlabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ghdlabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ghdlabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ghdlabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ghdlabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ghdlabreports@ghd.com

MATTHEW BALD

- *AU Certificate of Analysis - NATA (COA)	Email	matt.bald@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	matt.bald@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	matt.bald@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	matt.bald@ghd.com
- Chain of Custody (CoC) (COC)	Email	matt.bald@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	matt.bald@ghd.com
- EDI Format - XTab (XTAB)	Email	matt.bald@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	matt.bald@ghd.com

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB
National phone numbe

Sydney Lab - Envirolat
12 Ashley St, Chatswo
02 9910 6200 | syc

Perth Lab - MPL Labor
16-18 Hayden Crt, Mya
08 9317 2505 | lat

Melbourne Lab - Envir
25 Research Drive, Cr
03 9763 2500 | me

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Environmental Division
Melbourne
Work Order Reference
EM2215770

Telephone : +61-3-8549 9600

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title):
Contact Person: Matt Bald	12583428 - MFS Adelaide DSI - Sediment
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com dilara.valiff@ghd.com matt.bald@ghd.com ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
(1)	FS06	1P	12/08/2022	Sediment	x															FWD to ALS

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ALS	*Lab Use Only*	
Print Name: Matt Bald	Print Name: KSF	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 17/8/22 16:35	Temperature:	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

received & relinquished
16/8/22 17/8/22
ELs melb
Olsen

CHAIN OF CUSTODY FORM - Client

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Environmental Division
Melbourne
Work Order Reference
EM2215770

Telephone : + 61-3-8549 9600

ENVIROLAB
National phone numbe

Sydney Lab - Envirolat
12 Ashley St, Chatswo
02 9910 6200 | syc

Perth Lab - MPL Labor
16-18 Hayden Crt, Mya
08 9317 2505 | lat

Melbourne Lab - Envir
25 Research Drive, Cr
03 9763 2500 | me

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Sediment
Contact Person: Matt Bald	
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
(1)	FS06	1P	12/08/2022	Sediment	x															FWD to ALS

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ALS	Lab Use Only	
Print Name: Matt Bald	Print Name: KSF	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 17/8/22 16:35	Temperature:	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

received & relinquished
16/8/22 17/8/22
ELs melb
Olsen

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
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Sydney Lab - Envirolab Services
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Perth Lab - MPL Laboratories
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08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
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03 9763 2500 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
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08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Sediment
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No. :
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample Information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD									Provide as much information about the sample as you can
1	SED01	1P	12/08/2022	Sediment	x														
2	SED05	1P	12/08/2022	Sediment	x														
3	SED06	1P	12/08/2022	Sediment	x														
4	SED07	1P	12/08/2022	Sediment	x														
5	SED11	1P	12/08/2022	Sediment	x														
6	FD06	1P	12/08/2022	Sediment	x														
7	RB05	2P	12/08/2022	Water	x														

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS Melb	Lab Use Only
Print Name: Matt Bald	Print Name: L Olsen	Job number: 33105 / Cooling: Ice / Ice-pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 16/8/22 8.10am	Temperature: 7.1°C / Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

COC received 1.17pm 17/8/22.

CHAIN OF CUSTODY FORM - Client

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Melbourne Lab - Envirolab Services
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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Sediment
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No. :
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Additional report format: esdat
Phone: (08) 8111 6712 Mob: 0423 876 470	Lab Comments:
Email: GHDLabReports@ghd.com; dilara.valiff@ghd.com; matt.bald@ghd.com; ally.kirkman@ghd.com	

Sample Information					Tests Required																Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD											Provide as much information about the sample as you can
1	SED01	1P	12/08/2022	Sediment						x											
2	SED05	1P	12/08/2022	Sediment						x											
3	SED06	1P	12/08/2022	Sediment						x											
4	SED07	1P	12/08/2022	Sediment						x											
5	SED11	1P	12/08/2022	Sediment						x											
6	FD06	1P	12/08/2022	Sediment						x											
7	RB05	2P	12/08/2022	Water						x											

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

		Lab Use Only	
Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS	Job number: 33106	Cooling: Ice / Ice pack / None
Print Name: Matt Bald	Print Name: CR	Temperature: 7.1 C	Security seal: Intact / Broken / None
Date & Time: 15/08/2022; 1530	Date & Time: 16/8/22 8.10am	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	
Signature: MB	Signature:		

COC Received 3:13pm 16/8/22

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25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33105

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428 - MFS Adelaide DSI - Sediment**
Number of Samples	6 Soil, 1 Water
Date samples received	16/08/2022
Date completed instructions received	17/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	23/08/2022
Date of Issue	23/08/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Chris De Luca, Operations Manager
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short						
Our Reference		33105-1	33105-2	33105-3	33105-4	33105-5
Your Reference	UNITS	SED01	SED05	SED06	SED07	SED11
Date Sampled		12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	9.5	2.3	<5	2.6	<1
Perfluorooctanesulfonic acid PFOS	µg/kg	1,300	34	150	36	33
Perfluorooctanoic acid PFOA	µg/kg	4.0	<1	<5	<1	<1
6:2 FTS	µg/kg	5.3	<1	<5	<1	<1
8:2 FTS	µg/kg	16	<2	17	<2	<2
Surrogate $^{13}C_8$ PFOS	%	106	95	97	94	106
Surrogate $^{13}C_2$ PFOA	%	100	98	100	100	100
Extracted ISTD $^{18}O_2$ *PFHxS*	%	107	104	101	102	103
Extracted ISTD $^{13}C_4$ *PFOS*	%	108	116	104	108	103
Extracted ISTD $^{13}C_4$ *PFOA*	%	111	111	105	112	110
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	107	106	102	103	98
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	115	112	109	106	102
Total Positive PFHxS & PFOS	µg/kg	1,300	37	150	38	33
Total Positive PFOS & PFOA	µg/kg	1,300	34	150	36	33
Total Positive PFAS	µg/kg	1,300	37	170	38	33

PFAS in Soil Short		
Our Reference		33105-6
Your Reference	UNITS	FD06
Date Sampled		12/08/2022
Type of sample		Soil
Date prepared	-	19/08/2022
Date analysed	-	19/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	3.2
Perfluorooctanesulfonic acid PFOS	µg/kg	50
Perfluorooctanoic acid PFOA	µg/kg	<2
6:2 FTS	µg/kg	<2
8:2 FTS	µg/kg	<5
Surrogate $^{13}C_8$ PFOS	%	100
Surrogate $^{13}C_2$ PFOA	%	100
Extracted ISTD $^{18}O_2$ *PFHxS*	%	104
Extracted ISTD $^{13}C_4$ *PFOS*	%	86
Extracted ISTD $^{13}C_4$ *PFOA*	%	107
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	104
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	102
Total Positive PFHxS & PFOS	µg/kg	53
Total Positive PFOS & PFOA	µg/kg	50
Total Positive PFAS	µg/kg	53

Moisture						
Our Reference		33105-1	33105-2	33105-3	33105-4	33105-5
Your Reference	UNITS	SED01	SED05	SED06	SED07	SED11
Date Sampled		12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Moisture	%	47	39	78	37	18

Moisture		
Our Reference		33105-6
Your Reference	UNITS	FD06
Date Sampled		12/08/2022
Type of sample		Soil
Date prepared	-	18/08/2022
Date analysed	-	19/08/2022
Moisture	%	56

PFAS in Water Short		
Our Reference	UNITS	33105-7
Your Reference		RB05
Date Sampled		12/08/2022
Type of sample		Water
Date prepared	-	18/08/2022
Date analysed	-	18/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01
6:2 FTS	µg/L	<0.01
8:2 FTS	µg/L	<0.02
Surrogate $^{13}C_8$ PFOS	%	110
Surrogate $^{13}C_2$ PFOA	%	110
Extracted ISTD $^{18}O_2$ *PFHxS*	%	88
Extracted ISTD $^{13}C_4$ *PFOS*	%	90
Extracted ISTD $^{13}C_4$ *PFOA*	%	91
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	94
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	95
Total Positive PFHxS & PFOS	µg/L	<0.01
Total Positive PFOS & PFOA	µg/L	<0.01
Total Positive PFAS	µg/L	<0.01

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33105-2
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	1	9.5	12	23	100	114
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	1	1300	1200	8	105	##
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	1	4.0	3.9	3	102	104
6:2 FTS	µg/kg	0.1	Org-029	<0.1	1	5.3	5.7	7	101	103
8:2 FTS	µg/kg	0.2	Org-029	<0.2	1	16	16	0	114	103
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	1	106	98	8	101	119
Surrogate $^{13}C_2$ PFOA	%		Org-029	105	1	100	98	2	103	102
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	105	1	107	108	1	98	89
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	104	1	108	105	3	94	37
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	110	1	111	111	0	98	94
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	99	1	107	104	3	93	134
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	102	1	115	113	2	85	103

QUALITY CONTROL: PFAS in Water Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	107	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	114	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	111	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	106	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	116	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	109	[NT]	[NT]	[NT]	[NT]	113	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	102	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	89	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	85	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	96	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	92	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	89	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PFAS: PQL has been raised due to the sample matrix requiring dilution.

PQL has been raised further for 33105-3 and 33105-6 due to the high moisture content in the sample/s, resulting in a high dilution factor.

Matrix spike recovery is not possible to report for 33105-2 for PFOS due to the high concentration of analytes in the sample/s have caused interference. However, an acceptable recovery was obtained for the LCS.

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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Dilara Valiff

Sample Login Details

Your reference	12583428 - MFS Adelaide DSI - Sediment
Envirolab Reference	33105
Date Sample Received	16/08/2022
Date Instructions Received	17/08/2022
Date Results Expected to be Reported	23/08/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 Soil, 1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.1
Cooling Method	Icepack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Soil Short	PFAS in Water Short
SED01	✓	
SED05	✓	
SED06	✓	
SED07	✓	
SED11	✓	
FD06	✓	
RB05		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2215395**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: 08 8111 6712	Telephone	: +6138549 9645
Project	: 12583428 - MFS Adelaide DSI	Date Samples Received	: 11-Aug-2022 15:54
Order number	: ----	Date Analysis Commenced	: 12-Aug-2022
C-O-C number	: ----	Issue Date	: 16-Aug-2022 12:54
Sampler	: Ally Kirkman, MATTHEW BALD		
Site	: ----		
Quote number	: MEBQ/005/21 (Vic Only, Primary)		
No. of samples received	: 4		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Sanjay Parekh	LCMS Coordinator	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231X: Poor matrix spike recovery for sample EM2215167-024 due to sample matrix interference.
- EP231X: Samples EM2215395 required dilution due to matrix interferences. LOR values have been adjusted accordingly.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	FS01	FS02	FS03	----	----
			Sampling date / time	05-Aug-2022 00:00	05-Aug-2022 00:00	05-Aug-2022 00:00	----	----
Compound	CAS Number	LOR	Unit	EM2215395-001	EM2215395-002	EM2215395-003	--------	--------
				Result	Result	Result	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	**11.3**	**7.0**	**5.6**	**----**	**----**
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	**0.0020**	<0.0002	<0.0004	**----**	**----**
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	**0.0623**	**0.0019**	**0.0040**	**----**	**----**
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	**9.50**	**0.132**	**0.212**	**----**	**----**
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.002	<0.001	<0.002	**----**	**----**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	**0.0040**	<0.0002	<0.0004	**----**	**----**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	**0.0395**	**0.0005**	**0.0010**	**----**	**----**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	**0.0016**	<0.0002	<0.0004	**----**	**----**
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	**0.0048**	<0.0002	<0.0004	**----**	**----**
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	**----**	**----**
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	**0.0842**	<0.0005	<0.0005	**----**	**----**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	**0.0023**	<0.0005	**----**	**----**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	**----**	**----**
EP231P: PFAS Sums								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	**9.56**	**0.134**	**0.216**	**----**	**----**
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	**9.70**	**0.137**	**0.217**	**----**	**----**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**97.5**	**101**	**108**	**----**	**----**
13C8-PFOA	----	0.0002	%	**106**	**95.8**	**104**	**----**	**----**

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2215395**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: 08 8111 6712	Telephone	: +6138549 9645
Project	: 12583428 - MFS Adelaide DSI	Date Samples Received	: 11-Aug-2022
Order number	: ----	Date Analysis Commenced	: 12-Aug-2022
C-O-C number	: ----	Issue Date	: 16-Aug-2022
Sampler	: Ally Kirkman, MATTHEW BALD		
Site	: ----		
Quote number	: MEBQ/005/21 (Vic Only, Primary)		
No. of samples received	: 4		
No. of samples analysed	: 3		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Sanjay Parekh	LCMS Coordinator	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4515887)									
EM2215395-001	FS01	EA055: Moisture Content	----	0.1	%	11.3	12.2	7.5	0% - 20%
EM2215398-001	Anonymous	EA055: Moisture Content	----	0.1	%	21.8	21.6	1.0	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4517842)									
EM2215167-023	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0005	0.0005	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4517842)									
EM2215167-023	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4517842)									
EM2215167-023	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 4517842)									
EM2215167-023	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0005	0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231P: PFAS Sums (QC Lot: 4517842) - continued									
EM2215167-023	Anonymous	EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0005	0.0005	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4517842)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	99.0	72.0	128
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.0014 mg/kg	78.1	67.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	97.9	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4517842)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	97.2	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100.0	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.2	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.9	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4517842)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	103	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	104	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	107	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	103	70.0	130
EP231P: PFAS Sums (QCLot: 4517842)								
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4517842)							
EM2215167-024	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	105	72.0	128
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	96.1	67.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	92.9	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4517842)							
EM2215167-024	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	98.4	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	100	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	99.8	70.0	132

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4517842) - continued							
EM2215167-024	Anonymous	EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	94.9	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	97.4	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4517842)							
EM2215167-024	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	99.9	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	107	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	106	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	# 60.6	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2215395**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Telephone	: +6138549 9645
Project	: 12583428 - MFS Adelaide DSI	Date Samples Received	: 11-Aug-2022
Site	: ----	Issue Date	: 16-Aug-2022
Sampler	: Ally Kirkman, MATTHEW BALD	No. of samples received	: 4
Order number	: ----	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EM2215167--024	Anonymous	**10:2 Fluorotelomer sulfonic acid (10:2 FTS)**	120226-60-0	60.6 %	70.0-130%	**Recovery less than lower data quality objective**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) FS01, FS02, FS03	**05-Aug-2022**	**----**	----	----	**12-Aug-2022**	19-Aug-2022	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) FS01, FS02, FS03	**05-Aug-2022**	**15-Aug-2022**	01-Feb-2023	✓	**15-Aug-2022**	24-Sep-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) FS01, FS02, FS03	**05-Aug-2022**	**15-Aug-2022**	01-Feb-2023	✓	**15-Aug-2022**	24-Sep-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) FS01, FS02, FS03	**05-Aug-2022**	**15-Aug-2022**	01-Feb-2023	✓	**15-Aug-2022**	24-Sep-2022	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) FS01, FS02, FS03	**05-Aug-2022**	**15-Aug-2022**	01-Feb-2023	✓	**15-Aug-2022**	24-Sep-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2216107**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: 08 8111 6712	Telephone	: +6138549 9645
Project	: 12583428 - MFS Adelaide DSI	Date Samples Received	: 11-Aug-2022 15:54
Order number	: ----	Date Analysis Commenced	: 23-Aug-2022
C-O-C number	: ----	Issue Date	: 26-Aug-2022 15:29
Sampler	: Ally Kirkman, MATTHEW BALD		
Site	: ----		
Quote number	: MEBQ/005/21 (Vic Only, Primary)		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	FS04	----	----	----	----
				Sampling date / time	05-Aug-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2216107-001	--------	--------	--------	--------
					Result	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		**9.0**	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		**0.0024**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		**0.0353**	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		**0.0003**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		**0.0002**	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		**0.0034**	----	----	----	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		**0.0377**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		**0.0382**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		**97.2**	----	----	----	----
13C8-PFOA	----	0.0002	%		**101**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	68	136
13C8-PFOA	----	69	133

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2216107**	Page	: 1 of 5
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: 08 8111 6712	Telephone	: +6138549 9645
Project	: 12583428 - MFS Adelaide DSI	Date Samples Received	: 11-Aug-2022
Order number	: ----	Date Analysis Commenced	: 23-Aug-2022
C-O-C number	: ----	Issue Date	: 26-Aug-2022
Sampler	: Ally Kirkman, MATTHEW BALD		
Site	: ----		
Quote number	: MEBQ/005/21 (Vic Only, Primary)		
No. of samples received	: 1		
No. of samples analysed	: 1		

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Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 4535577)									
EM2215170-001	Anonymous	EA055: Moisture Content	----	0.1	%	9.6	10.5	9.3	0% - 20%
EM2215170-030	Anonymous	EA055: Moisture Content	----	0.1	%	11.1	11.3	1.3	0% - 20%
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 4536007)									
EM2215979-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2215989-065	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 4536007)									
EM2215979-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EM2215989-065	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4536007)									
EM2215979-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 4536007) - continued									
EM2215979-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EM2215989-065	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 4536007)									
EM2215979-001	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EM2215989-065	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4536007)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00111 mg/kg	96.4	72.0	128
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.0014 mg/kg	72.5	67.0	130
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	84.8	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4536007)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	99.4	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.7	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4536007)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	106	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00119 mg/kg	112	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	101	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00121 mg/kg	97.3	70.0	130
EP231P: PFAS Sums (QCLot: 4536007)								
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4536007)							
EM2215979-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00111 mg/kg	103	72.0	128
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00114 mg/kg	91.5	67.0	130
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	89.4	68.0	136
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4536007)							
EM2215979-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	99.9	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	98.4	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	97.9	70.0	132

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4536007) - continued							
EM2215979-002	Anonymous	EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	99.0	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	93.5	69.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4536007)							
EM2215979-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	111	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00119 mg/kg	102	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	107	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00121 mg/kg	82.1	70.0	130

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2216107**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Telephone	: +6138549 9645
Project	: 12583428 - MFS Adelaide DSI	Date Samples Received	: 11-Aug-2022
Site	: ----	Issue Date	: 26-Aug-2022
Sampler	: Ally Kirkman, MATTHEW BALD	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA055: Moisture Content (Dried @ 105-110°C)						
HDPE Soil Jar						
FS04	----	----	----	23-Aug-2022	19-Aug-2022	**4**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055)							
FS04	**05-Aug-2022**	**----**	----	----	**23-Aug-2022**	19-Aug-2022	×
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X)							
FS04	**05-Aug-2022**	**23-Aug-2022**	01-Feb-2023	✓	**24-Aug-2022**	02-Oct-2022	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X)							
FS04	**05-Aug-2022**	**23-Aug-2022**	01-Feb-2023	✓	**24-Aug-2022**	02-Oct-2022	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X)							
FS04	**05-Aug-2022**	**23-Aug-2022**	01-Feb-2023	✓	**24-Aug-2022**	02-Oct-2022	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X)							
FS04	**05-Aug-2022**	**23-Aug-2022**	01-Feb-2023	✓	**24-Aug-2022**	02-Oct-2022	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
QuECheRS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2216107**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: matt.bald@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: 08 8111 6712	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12583428 - MFS Adelaide DSI	Page	: 1 of 3
Order number	: ----	Quote number	: EM2021GHDSER0057 (MEBQ/005/21 (Vic Only, Primary))
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Ally Kirkman, MATTHEW BALD		

Dates

Date Samples Received	: 11-Aug-2022 15:54	Issue Date	: 23-Aug-2022
Client Requested Due Date	: 26-Aug-2022	Scheduled Reporting Date	: **26-Aug-2022**

Delivery Details

Mode of Delivery	: Samples On Hand	Security Seal	: Not Available
No. of coolers/boxes	: ----	Temperature	: ----
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - EA055-103 Moisture Content	SOIL - EP231 (solids) PFAS - Short Suite (12 analytes)
EM2216107-001	05-Aug-2022 00:00	FS04	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Accounts Payable Australia		
- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com
ALLY KIRKMAN		
- *AU Certificate of Analysis - NATA (COA)	Email	ally.kirkman@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ally.kirkman@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ally.kirkman@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ally.kirkman@ghd.com
- Chain of Custody (CoC) (COC)	Email	ally.kirkman@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ally.kirkman@ghd.com
- EDI Format - XTab (XTAB)	Email	ally.kirkman@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ally.kirkman@ghd.com
DILARA VALIFF		
- *AU Certificate of Analysis - NATA (COA)	Email	dilara.valiff@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	dilara.valiff@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	dilara.valiff@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	dilara.valiff@ghd.com
- Chain of Custody (CoC) (COC)	Email	dilara.valiff@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	dilara.valiff@ghd.com
- EDI Format - XTab (XTAB)	Email	dilara.valiff@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	dilara.valiff@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	ghdlabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ghdlabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ghdlabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ghdlabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ghdlabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ghdlabreports@ghd.com
MATTHEW BALD		
- *AU Certificate of Analysis - NATA (COA)	Email	matt.bald@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	matt.bald@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	matt.bald@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	matt.bald@ghd.com
- Chain of Custody (CoC) (COC)	Email	matt.bald@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	matt.bald@ghd.com
- EDI Format - XTab (XTAB)	Email	matt.bald@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	matt.bald@ghd.com

Rebatch

Client / Client code: GHDSER
Project: 12583428 - MFS ADELAIDE DSI
Project Manager: MATTHEW BALD
Date /time sample rec: 11/08/2022 16:24
Date/time Instructions rec: 19/08/2022 6:31PM
Due date: Monday, 29 August 2022
Due date surcharge: **STANDARD**

CS Contact: PETER RAVLIC
Additional Information:
PLEASE INCLUDE REPORT RECIPIENTS FROM ORIGIONAL WORKORDER EM2215395. THANK YOU!

Environmental Division
Melbourne
Work Order Reference
EM2216107

Telephone : + 61-3-8549 9600

New Lab ID	Sample information						Number of Containers	Analysis										Shortest Holding time expiry
								Standard					Leach					
	Client ID	Sampling Date / Time	Previous Work Order Reference	Previous ALS ID	Tray Number(s)	Container		PFAS - SHORT SUITE (12 ANALYTES)										
1	FS04	5/08/2022 0:00	EM2215395	4	MS: 4946 (PFAS ON HOLD)		1	X										01-Feb-23
						TOTAL	1											

Felix Dong

From: Emily Chan
Sent: Monday, 22 August 2022 9:13 AM
To: COC Melbourne
Cc: Peter Ravlic
Subject: FW: GHDSER - EM2215395 - 12583428 MFS ADELAIDE DSI - REBATCH - 22.08.2022
Attachments: GHDSER - EM2215395 - 12583428 MFS ADELAIDE DSI - REBATCH - 22.08.2022.xlsm

Follow Up Flag: Follow up
Flag Status: Flagged

Categories: Rebatch

Good Morning Team!

Please see attached rebatch for GHDSER for workorder EM2215395.

1 sample x PFAS short suite

Thank you!

Kind Regards,

right solutions. right partner.

Emily Chan
Client Service Officer, Environmental
ALS Limited

T: +61 3 8549 9600
D: +61 3 8549 9652

emily.chan@alsglobal.com

2-4 Westall Road, Springvale VIC 3171

alsglobal.com

From: Matt Bald <Matt.Bald@ghd.com>
Sent: Friday, 19 August 2022 6:31 PM
To: ALS Enviro Melbourne <ALSEnviroMelbourne@ALSGlobal.com>
Cc: Adelaide <Adelaide@alsglobal.com>; Peter Ravlic <peter.ravlic@alsglobal.com>; Kieren Burns <Kieren.Burns@alsglobal.com>; Dilara Valiff <Dilara.Valiff@ghd.com>
Subject: [EXTERNAL] - GHD 12583428 - Batch EM2215395 - additional soil analysis request

Hi ALS Team,

Could you please arrange analysis of the following additional samples (currently 'on hold') from batch EM2215395 for **'PFAS – Short Suite (12 analytes)**?

- FS04

Any queries or additional information required regarding this request, please let me know.

Kind regards,
Matt

Matt Bald (he/him)
BSc (Hons)
Environmental Scientist

GHD
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Level 4, 211 Victoria Square, Adelaide SA 5000, Australia
D +61 8 8111 6712 **M** +61 423 876 470 **E** matt.bald@ghd.com

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Connect

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2215395**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MATTHEW BALD	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: matt.bald@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: 08 8111 6712	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12583428 - MFS Adelaide DSI	Page	: 1 of 3
Order number	: ----	Quote number	: EM2021GHDSER0057 (MEBQ/005/21 (Vic Only, Primary))
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Ally Kirkman, MATTHEW BALD		

Dates

Date Samples Received	: 11-Aug-2022 15:54	Issue Date	: 12-Aug-2022
Client Requested Due Date	: 18-Aug-2022	Scheduled Reporting Date	: **18-Aug-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 12.5°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 4 / 3

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
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Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	(On Hold) SOIL No analysis requested	SOIL - EA055-103 Moisture Content	SOIL - EP231 (solids) PFAS - Short Suite (12 analytes)
EM2215395-001	05-Aug-2022 00:00	FS01		✓	✓
EM2215395-002	05-Aug-2022 00:00	FS02		✓	✓
EM2215395-003	05-Aug-2022 00:00	FS03		✓	✓
EM2215395-004	05-Aug-2022 00:00	FS04	✓		

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

Accounts Payable Australia		
- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com
ALLY KIRKMAN		
- *AU Certificate of Analysis - NATA (COA)	Email	ally.kirkman@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ally.kirkman@ghd.com
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- EDI Format - XTab (XTAB)	Email	ally.kirkman@ghd.com
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- Electronic SRN for ESdat (ESRN_ESDAT)	Email	dilara.valiff@ghd.com
GHD LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	ghdlabreports@ghd.com
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- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ghdlabreports@ghd.com
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MATTHEW BALD		
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- EDI Format - XTab (XTAB)	Email	matt.bald@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	matt.bald@ghd.com

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 34

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirola

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South,
03 9763 2500 | melbourne@env

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Environmental Division
Melbourne
Work Order Reference
EM2215395

Telephone : + 61-3-8549 9600

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No. :
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Additional report format: esdat
Phone: (08) 8111 6712 Mob: 0423 876 470	Lab Comments:
Email: GHDLabReports@ghd.com; dilara.valiff@ghd.com; matt.bald@ghd.com; ally.kirkman@ghd.com	

Sample information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled m/d/y	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	FS01	1P	8/5/2022	Soil	x															FWD to ALS
2	FS02	1P	8/5/2022	Soil	x															FWD to ALS
3	FS03	1P	8/5/2022	Soil	x															FWD to ALS
4	FS04	1P	8/5/2022	Soil						x										FWD to ALS

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

		Lab Use Only	
Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ALS	Job number:	Cooling: Ice / Ice pack / None
Print Name: Matt Bald	Print Name: RSF	Temperature:	Security seal: Intact / Broken / None
Date & Time: 08/08/2022; 1400	Date & Time: 11/8/22 16:24	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	
Signature: MB	Signature:		

Relinquished ELS Melb AP 11/8/22

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
02 9910 6200 | sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
08 9317 2505 | lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
03 9763 2600 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
08 7087 6800 | adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
08 8967 1201 | darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI
Contact Person: Matt Bald	
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	BH05_0.1-0.2	1P	8/4/2022	Soil	x					x										Fill
2	BH05_0.4-0.5	1P	8/4/2022	Soil	x															Fill
3	BH05_1.0-1.1	1P	8/4/2022	Soil	x															Natural
4	BH05_1.5-1.6	1P	8/4/2022	Soil						x										Natural
5	BH05_2.4-2.5	1P	8/4/2022	Soil						x										Natural
6	BH06_0.1-0.2	1P	8/4/2022	Soil	x															Fill
7	BH06_0.4-0.5	1P	8/4/2022	Soil	x															Fill
8	BH06_1.0-1.1	1P	8/4/2022	Soil						x										Fill
9	BH06_1.6-1.7	1P	8/4/2022	Soil						x										Natural
10	BH06_2.4-2.5	1P	8/4/2022	Soil						x										Natural
11	BH07_0.1-0.2	1P	8/5/2022	Soil						x										Fill
12	BH07_0.4-0.5	1P	8/5/2022	Soil	x															Fill

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS Melb	Lab Use Only
Print Name: Matt Bald	Print Name: L Olsen	Job number: 33011 / Cooling: Ice / Ice pack / None
Date & Time: 08/08/2022; 1400	Date & Time: 9/8/22 8:00am	Temperature: 8.4°C / Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

COC received 11/8/22 12.10pm

CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
✆ 02 9910 6200 | ✉ sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6600 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
✆ 07 3266 9532 | ✉ brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No.:
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com; dilara.valiff@ghd.com; matt.bald@ghd.com; ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD									Provide as much information about the sample as you can
13	BH07_0.9-1.0	1P	8/5/2022	Soil	x														Fill
14	BH07_1.3-1.4	1P	8/5/2022	Soil						x									Fill
15	BH08_0.1-0.2	1P	8/5/2022	Soil	x														Fill
16	BH08_0.4-0.5	2P	8/5/2022	Soil	x														Fill
17	BH08_1.0-1.1	1P	8/5/2022	Soil						x									Fill
18	BH08_1.6-1.7	1P	8/5/2022	Soil						x									Natural
19	BH08_2.4-2.5	1P	8/5/2022	Soil						x									Natural
20	BH09_0.1-0.2	1P	8/5/2022	Soil	x														Fill
21	BH09_0.4-0.5	1P	8/5/2022	Soil	x														Fill
22	BH09_1.1-1.2	1P	8/5/2022	Soil						x									Natural (?) w/ HC odour
23	BH09_2.3-2.4	1P	8/5/2022	Soil						x									Natural (?) w/ HC odour
24	BH09B_3.4-3.5	1P	8/5/2022	Soil						x									Natural

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS Melb	*Lab Use Only*	
Print Name: Matt Bald	Print Name: L Olsen	Job number: 33011	Cooling: Ice / Ice pack / None
Date & Time: 08/08/2022; 1400	Date & Time: 9/8/22 8am	Temperature: 8.4°C	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

CHAIN OF CUSTODY FORM - Client

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National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
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Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No.:
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Additional report format: esdat
Phone: (08) 8111 6712 Mob: 0423 876 470	Lab Comments:
Email: GHDLabReports@ghd.com; dilara.valiff@ghd.com; matt.bald@ghd.com; ally.kirkman@ghd.com	

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
25	BH11_0.1-0.2	1P	8/5/2022	Soil	x															Fill
26	BH11_0.4-0.5	1P	8/5/2022	Soil	x															Fill
27	BH12_0.1-0.2	2P	8/4/2022	Soil	x															Fill
28	BH12_0.4-0.5	1P	8/4/2022	Soil	x															Fill
29	BH12_1.0-1.1	1P	8/4/2022	Soil						x										Natural
30	BH12_1.5-1.6	1P	8/4/2022	Soil						x										Natural
31	BH12_2.4-2.5	1P	8/4/2022	Soil						x										Fill
32	BH13_0.1-0.2	1P	8/4/2022	Soil	x															Fill
33	BH13_0.4-0.5	1P	8/4/2022	Soil	x															Fill
34	BH13_0.9-1.0	1P	8/4/2022	Soil						x										Natural
35	BH13_1.4-1.5	1P	8/4/2022	Soil						x										Natural
36	BH13_2.3-2.4	1P	8/4/2022	Soil						x										

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

		Lab Use Only	
Relinquished by (Company): Matt Bald (GHD)	Received by (Company):	Job number: 33011	Cooling: Ice / Ice-pack / None
Print Name: Matt Bald	Print Name: L O | Sen	Temperature: 8.4°C	Security seal: Intact / Broken / None
Date & Time: 08/08/2022; 1400	Date & Time: 9 | 8 | 22 8am	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	
Signature: MB	Signature:		

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Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title):
Contact Person: Matt Bald	12583428 - MFS Adelaide DSI
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com dilara.valiff@ghd.com matt.bald@ghd.com ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD									Provide as much information about the sample as you can
37	BH14_0.1-0.2	1P	8/5/2022	Soil	x														Fill
38	BH14_0.4-0.5	1P	8/5/2022	Soil	x														Fill
39	BH14_1.0-1.1	1P	8/5/2022	Soil						x									Fill
40	BH14_1.6-1.7	1P	8/5/2022	Soil						x									Natural
41	BH14_2.4-2.5	1P	8/5/2022	Soil						x									Natural
42	BH15_0.1-0.2	1P	8/5/2022	Soil	x														Fill
43	BH15_0.4-0.5	1P	8/5/2022	Soil	x														Fill
44	BH15_0.9-1.0	1P	8/5/2022	Soil						x									Fill
45	BH15_1.6-1.7	1P	8/5/2022	Soil						x									Natural
46	BH15_2.4-2.5	1P	8/5/2022	Soil						x									Natural
47	BH16_0.1-0.2	1P	8/5/2022	Soil	x														Fill
48	BH16_0.4-0.5	2P	8/5/2022	Soil	x														Fill

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company):	*Lab Use Only*	
Print Name: Matt Bald	Print Name: Colsen	Job number: 33011	Cooling: Ice / Ice pack / None
Date & Time: 08/08/2022; 1400	Date & Time: 9/8/22 8am	Temperature: 8.4°C	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

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Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No. :
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD									Provide as much information about the sample as you can
49	BH18_1.0-1.1	1P	8/5/2022	Soil						x									Natural
50	BH16_1.6-1.7	1P	8/5/2022	Soil						x									Natural
51	BH16_2.4-2.5	1P	8/5/2022	Soil						x									Natural
52	BH18_0.2-0.3	1P	8/5/2022	Soil	x														Fill
53	BH18_0.5-0.6	1P	8/5/2022	Soil	x														Fill
54	BH18_1.0-1.1	1P	8/5/2022	Soil						x									Fill
55	BH18_1.6-1.7	1P	8/5/2022	Soil						x									Natural
56	BH18_2.4-2.5	1P	8/5/2022	Soil						x									Natural
57	FD01	1P	8/5/2022	Soil	x														Field Duplicate
58	FD02	1P	8/5/2022	Soil	x														Field Duplicate
59	FD03	1P	8/5/2022	Soil	x														Field Duplicate
60	FD04	1P	8/5/2022	Soil						x									Field Duplicate

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS	Lab Use Only	
Print Name: Matt Bald	Print Name: L Olsen	Job number: 33011	Cooling: Ice / Ice pack / None
Date & Time: 08/08/2022; 1400	Date & Time: 9/8/22 8.am	Temperature: 8.9 4.0 °C	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

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Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No.:
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD									Provide as much information about the sample as you can
61	RB01	2P	8/4/2022	Water	x														Rinsate sample (core liner)
62	RB02	2P	8/5/2022	Water	x														Rinsate sample (gloves)

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company):	*Lab Use Only*	
Print Name: Matt Bald	Print Name: L Olsen	Job number: 532011	Cooling: Ice / Ice-pack / None
Date & Time: 08/08/2022; 1400	Date & Time: 9/8/22 8.am	Temperature: 8.4°C	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Sample Receipt Melbourne

From: Adelaide
Sent: Thursday, 11 August 2022 12:10 PM
To: Gemma Sliz; Sample Receipt Melbourne
Subject: FW: Job 12583428 - COCs
Attachments: 12583428_MFSAdelaideDSI_EnvirolabCOC_On-SiteSoil.pdf

Updated, to include BH05_0.1-0.2 for PFAS

From: Steven Castillo <Steven.Castillo@ghd.com>
Sent: Thursday, 11 August 2022 11:35 AM
To: Adelaide <adelaide@envirolab.com.au>; Alex Stenta <astenta@envirolab.com.au>
Cc: Dilara Valiff <Dilara.Valiff@ghd.com>; Matt Bald <Matt.Bald@ghd.com>; Ally Kirkman <Ally.Kirkman@ghd.com>
Subject: RE: Job 12583428 - COCs

Hi again Alex,

Please see attached updated COC – it turns out we will also be needing sample BH05_0.1-0.2 to be analysed for PFAS. Sorry for the last minute change!

Thanks,

Steven Castillo (he/him)
BSc (Hons) Environmental Science
Graduate Environmental Scientist

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Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6832 M +61 408 004 659 E steven.castillo@ghd.com

---

From: Adelaide <adelaide@envirolab.com.au>
Sent: Thursday, August 11, 2022 11:31 AM
To: Steven Castillo <Steven.Castillo@ghd.com>; Alex Stenta <astenta@envirolab.com.au>; Adelaide <adelaide@envirolab.com.au>
Cc: Dilara Valiff <Dilara.Valiff@ghd.com>; Matt Bald <Matt.Bald@ghd.com>; Ally Kirkman <Ally.Kirkman@ghd.com>
Subject: RE: Job 12583428 - COCs

Thank you Steven

Kind Regards,

Sample Receipt Melbourne

From: Matt Bald <Matt.Bald@ghd.com>
Sent: Monday, 8 August 2022 3:44 PM
To: Adelaide; Alex Stenta
Subject: RE: GHD 12583428 - PFAS sampling consumables

Hi Alex, Team,

As discussed over the phone, could you please arrange courier collection of 2 x eskys (soil samples) from **71 Francis Street, North Brighton SA 5048** this afternoon?

GHD reference is 12583428.

One esky with HDPE containers for PFAS analysis, the other with a handful of glass jars for TRH/BTEXN analysis based on some unexpected finds in the field... full analytical request / COC will be emailed through by tomorrow AM. We want the glass jars logged as a separate batch / report.

Any other info required at this stage, let me know ☺

Kind regards,
Matt

Matt Bald (he/him)
BSc (Hons)
Environmental Scientist

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→ The Power of Commitment

Connect

Envirolab Services
25 Research Drive
Croydon South VIC 3136
Ph. (03) 9763 2500

Job No

Date Received 8am
Time Received 9/8/22
Received By GS
Temp (Cool) Ambient
Cooling Ice / (pack)
Security (Intact) Broken/None

8.4

From: Adelaide <adelaide@envirolab.com.au>
Sent: Wednesday, 3 August 2022 10:00 AM
To: Matt Bald <Matt.Bald@ghd.com>; Adelaide <adelaide@envirolab.com.au>; Alex Stenta <astenta@envirolab.com.au>
Subject: RE: GHD 12583428 - PFAS sampling consumables

Hi Matt,

We certainly can, will send over shortly.

Kind Regards,

Adelaide | Reception | Envirolab Services

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33011

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428-MFS Adelaide DSI**
Number of Samples	60 Soil, 2 Water
Date samples received	09/08/2022
Date completed instructions received	11/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	18/08/2022
Date of Issue	17/08/2022

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Results Approved By
Ken Nguyen, Senior Customer Service
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short						
Our Reference		33011-1	33011-2	33011-3	33011-6	33011-7
Your Reference	UNITS	BH05_0.1-0.2	BH05_0.4-0.5	BH05_1.0-1.1	BH06_0.1-0.2	BH06_0.4-0.5
Date Sampled		04/08/2022	04/08/2022	04/08/2022	04/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	350	38	18	3.5	19
Perfluorooctanesulfonic acid PFOS	µg/kg	2,600	370	660	93	700
Perfluorooctanoic acid PFOA	µg/kg	49	3.0	3.1	0.4	1.3
6:2 FTS	µg/kg	13	0.4	0.4	0.2	0.8
8:2 FTS	µg/kg	1	0.6	0.5	1	<0.2
Surrogate $^{13}C_8$ PFOS	%	98	97	97	96	95
Surrogate $^{13}C_2$ PFOA	%	100	95	98	97	98
Extracted ISTD $^{18}O_2$ *PFHxS*	%	105	83	78	86	84
Extracted ISTD $^{13}C_4$ *PFOS*	%	109	106	114	111	113
Extracted ISTD $^{13}C_4$ *PFOA*	%	110	91	86	96	96
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	72	83	79	85	95
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	101	106	99	108	120
Total Positive PFHxS & PFOS	µg/kg	3,000	410	680	97	720
Total Positive PFOS & PFOA	µg/kg	2,700	380	660	94	710
Total Positive PFAS	µg/kg	3,100	420	680	99	730

PFAS in Soil Short						
Our Reference		33011-12	33011-13	33011-15	33011-16	33011-20
Your Reference	UNITS	BH07_0.4-0.5	BH07_0.9-1.0	BH08_0.1-0.2	BH08_0.4-0.5	BH09_0.1-0.2
Date Sampled		05/08/2022	05/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	51	210	4.9	27	1.5
Perfluorooctanesulfonic acid PFOS	µg/kg	8,100	3,900	200	990	29
Perfluorooctanoic acid PFOA	µg/kg	5.3	18	0.5	2.1	0.2
6:2 FTS	µg/kg	61	42	0.7	0.7	0.4
8:2 FTS	µg/kg	<0.2	<0.2	2.3	0.4	2
Surrogate $^{13}C_8$ PFOS	%	97	99	97	96	104
Surrogate $^{13}C_2$ PFOA	%	96	99	96	96	99
Extracted ISTD $^{18}O_2$ *PFHxS*	%	109	109	84	82	84
Extracted ISTD $^{13}C_4$ *PFOS*	%	108	111	110	109	78
Extracted ISTD $^{13}C_4$ *PFOA*	%	85	63	89	94	86
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	128	128	90	90	95
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	115	100	93	110	91
Total Positive PFHxS & PFOS	µg/kg	8,100	4,100	200	1,000	31
Total Positive PFOS & PFOA	µg/kg	8,100	3,900	200	990	29
Total Positive PFAS	µg/kg	8,200	4,100	210	1,000	33

PFAS in Soil Short						
Our Reference		33011-21	33011-25	33011-26	33011-27	33011-28
Your Reference	UNITS	BH09_0.4-0.5	BH11_0.1-0.2	BH11_0.4-0.5	BH12_0.1-0.2	BH12_0.4-0.5
Date Sampled		05/08/2022	04/08/2022	04/08/2022	04/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	12	1	1.6	5.9	4.1
Perfluorooctanesulfonic acid PFOS	µg/kg	460	7.5	52	4,500	410
Perfluorooctanoic acid PFOA	µg/kg	1.4	0.2	0.3	2.0	0.5
6:2 FTS	µg/kg	3.2	<0.1	0.2	32	2.0
8:2 FTS	µg/kg	7.4	1	5.8	14	1
Surrogate $^{13}C_8$ PFOS	%	93	98	98	94	96
Surrogate $^{13}C_2$ PFOA	%	98	97	100	100	97
Extracted ISTD $^{18}O_2$ *PFHxS*	%	80	85	85	80	83
Extracted ISTD $^{13}C_4$ *PFOS*	%	114	84	76	108	112
Extracted ISTD $^{13}C_4$ *PFOA*	%	99	92	93	84	97
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	82	90	75	76	100
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	119	98	82	85	99
Total Positive PFHxS & PFOS	µg/kg	470	8.5	54	4,500	420
Total Positive PFOS & PFOA	µg/kg	460	7.8	53	4,500	410
Total Positive PFAS	µg/kg	480	9.7	60	4,500	420

PFAS in Soil Short						
Our Reference		33011-32	33011-33	33011-37	33011-38	33011-42
Your Reference	UNITS	BH13_0.1-0.2	BH13_0.4-0.5	BH14_0.1-0.2	BH14_0.4-0.5	BH15_0.1-0.2
Date Sampled		04/08/2022	04/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	1.6	9.9	5.5	8.9	8.0
Perfluorooctanesulfonic acid PFOS	µg/kg	100	520	240	660	150
Perfluorooctanoic acid PFOA	µg/kg	0.1	0.6	0.4	0.8	0.6
6:2 FTS	µg/kg	<0.1	0.2	0.1	1.5	0.2
8:2 FTS	µg/kg	0.4	<0.2	0.3	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	94	94	94	96	91
Surrogate $^{13}C_2$ PFOA	%	93	93	99	101	95
Extracted ISTD $^{18}O_2$ *PFHxS*	%	88	86	89	88	87
Extracted ISTD $^{13}C_4$ *PFOS*	%	112	113	110	113	112
Extracted ISTD $^{13}C_4$ *PFOA*	%	98	101	92	90	95
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	91	88	88	92	97
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	92	142	104	86	104
Total Positive PFHxS & PFOS	µg/kg	100	530	250	670	160
Total Positive PFOS & PFOA	µg/kg	100	520	240	670	150
Total Positive PFAS	µg/kg	100	530	250	680	160

PFAS in Soil Short						
Our Reference		33011-43	33011-47	33011-48	33011-52	33011-53
Your Reference	UNITS	BH15_0.4-0.5	BH16_0.1-0.2	BH16_0.4-0.5	BH18_0.2-0.3	BH18_0.5-0.6
Date Sampled		05/08/2022	05/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	15/08/2022	15/08/2022	15/08/2022	15/08/2022	15/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	17	8.7	5.3	22	1.3
Perfluorooctanesulfonic acid PFOS	µg/kg	12	130	330	16	0.1
Perfluorooctanoic acid PFOA	µg/kg	2.7	0.6	1.4	1.9	0.1
6:2 FTS	µg/kg	<0.1	0.3	0.8	2.0	<0.1
8:2 FTS	µg/kg	<0.2	0.4	3.3	<2	<0.2
Surrogate $^{13}C_8$ PFOS	%	102	95	93	100	104
Surrogate $^{13}C_2$ PFOA	%	97	98	99	100	94
Extracted ISTD $^{18}O_2$ *PFHxS*	%	87	83	88	104	85
Extracted ISTD $^{13}C_4$ *PFOS*	%	86	110	107	110	85
Extracted ISTD $^{13}C_4$ *PFOA*	%	90	93	87	118	92
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	85	86	90	110	89
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	76	91	85	138	125
Total Positive PFHxS & PFOS	µg/kg	29	140	330	38	1.5
Total Positive PFOS & PFOA	µg/kg	15	130	330	18	0.3
Total Positive PFAS	µg/kg	31	140	340	42	1.6

PFAS in Soil Short				
Our Reference		33011-57	33011-58	33011-59
Your Reference	UNITS	FD01	FD02	FD03
Date Sampled		05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	15/08/2022	15/08/2022	15/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	47	2.7	4.6
Perfluorooctanesulfonic acid PFOS	µg/kg	8,700	130	180
Perfluorooctanoic acid PFOA	µg/kg	5.3	0.3	0.3
6:2 FTS	µg/kg	69	0.2	0.1
8:2 FTS	µg/kg	0.3	2.4	0.2
Surrogate $^{13}C_8$ PFOS	%	92	90	90
Surrogate $^{13}C_2$ PFOA	%	101	99	103
Extracted ISTD $^{18}O_2$ PFHxS	%	111	83	83
Extracted ISTD $^{13}C_4$ PFOS	%	117	114	113
Extracted ISTD $^{13}C_4$ PFOA	%	86	93	94
Extracted ISTD $^{13}C_2$ 6:2FTS	%	130	87	96
Extracted ISTD $^{13}C_2$ 8:2FTS	%	118	89	95
Total Positive PFHxS & PFOS	µg/kg	8,800	140	190
Total Positive PFOS & PFOA	µg/kg	8,700	130	180
Total Positive PFAS	µg/kg	8,800	140	190

Moisture						
Our Reference		33011-1	33011-2	33011-3	33011-6	33011-7
Your Reference	UNITS	BH05_0.1-0.2	BH05_0.4-0.5	BH05_1.0-1.1	BH06_0.1-0.2	BH06_0.4-0.5
Date Sampled		04/08/2022	04/08/2022	04/08/2022	04/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	13/08/2022	13/08/2022	13/08/2022	13/08/2022	13/08/2022
Moisture	%	4.3	15	29	11	16

Moisture						
Our Reference		33011-12	33011-13	33011-15	33011-16	33011-20
Your Reference	UNITS	BH07_0.4-0.5	BH07_0.9-1.0	BH08_0.1-0.2	BH08_0.4-0.5	BH09_0.1-0.2
Date Sampled		05/08/2022	05/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	13/08/2022	13/08/2022	13/08/2022	13/08/2022	13/08/2022
Moisture	%	10	12	6.7	20	9.1

Moisture						
Our Reference		33011-21	33011-25	33011-26	33011-27	33011-28
Your Reference	UNITS	BH09_0.4-0.5	BH11_0.1-0.2	BH11_0.4-0.5	BH12_0.1-0.2	BH12_0.4-0.5
Date Sampled		05/08/2022	04/08/2022	04/08/2022	04/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	13/08/2022	13/08/2022	13/08/2022	13/08/2022	13/08/2022
Moisture	%	20	6.5	7.8	8.6	10

Moisture						
Our Reference		33011-32	33011-33	33011-37	33011-38	33011-42
Your Reference	UNITS	BH13_0.1-0.2	BH13_0.4-0.5	BH14_0.1-0.2	BH14_0.4-0.5	BH15_0.1-0.2
Date Sampled		04/08/2022	04/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	13/08/2022	13/08/2022	13/08/2022	13/08/2022	13/08/2022
Moisture	%	7.2	11	6.0	7.0	3.7

Moisture						
Our Reference		33011-43	33011-47	33011-48	33011-52	33011-53
Your Reference	UNITS	BH15_0.4-0.5	BH16_0.1-0.2	BH16_0.4-0.5	BH18_0.2-0.3	BH18_0.5-0.6
Date Sampled		05/08/2022	05/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	13/08/2022	13/08/2022	13/08/2022	13/08/2022	13/08/2022
Moisture	%	3.6	9.4	17	7.1	20

Moisture				
Our Reference		33011-57	33011-58	33011-59
Your Reference	UNITS	FD01	FD02	FD03
Date Sampled		05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil
Date prepared	-	12/08/2022	12/08/2022	12/08/2022
Date analysed	-	13/08/2022	13/08/2022	13/08/2022
Moisture	%	12	7.2	6.3

PFAS in Water Short			
Our Reference	UNITS	33011-61	33011-62
Your Reference		RB01	RB02
Date Sampled		04/08/2022	05/08/2022
Type of sample		Water	Water
Date prepared	-	12/08/2022	12/08/2022
Date analysed	-	12/08/2022	12/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	<0.01	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01	<0.01
6:2 FTS	µg/L	<0.01	<0.01
8:2 FTS	µg/L	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	101	97
Surrogate $^{13}C_2$ PFOA	%	100	98
Extracted ISTD $^{18}O_2$ *PFHxS*	%	95	95
Extracted ISTD $^{13}C_4$ *PFOS*	%	96	98
Extracted ISTD $^{13}C_4$ *PFOA*	%	99	101
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	99	100
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	109	106
Total Positive PFHxS & PFOS	µg/L	<0.01	<0.01
Total Positive PFOS & PFOA	µg/L	<0.01	<0.01
Total Positive PFAS	µg/L	<0.01	<0.01

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33011-2
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	1	350	430	21	99	106
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	1	2600	2800	7	102	##
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	1	49	56	13	105	114
6:2 FTS	µg/kg	0.1	Org-029	<0.1	1	13	16	21	100	108
8:2 FTS	µg/kg	0.2	Org-029	<0.2	1	1	1	0	82	114
Surrogate $^{13}C_8$ PFOS	%		Org-029	101	1	98	94	4	96	112
Surrogate $^{13}C_2$ PFOA	%		Org-029	95	1	100	95	5	102	100
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	94	1	105	102	3	95	79
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	96	1	109	111	2	93	37
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	103	1	110	114	4	91	86
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	91	1	72	73	1	92	84
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	83	1	101	96	5	103	102

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-2	33011-47
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	[NT]	21	12	11	9	109	##
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	[NT]	21	460	450	2	102	##
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	[NT]	21	1.4	1.4	0	109	104
6:2 FTS	µg/kg	0.1	Org-029	[NT]	21	3.2	2.5	25	104	105
8:2 FTS	µg/kg	0.2	Org-029	[NT]	21	7.4	5.6	28	94	95
Surrogate $^{13}C_8$ PFOS	%		Org-029	[NT]	21	93	93	0	99	104
Surrogate $^{13}C_2$ PFOA	%		Org-029	[NT]	21	98	97	1	97	99
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	[NT]	21	80	82	2	89	84
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	[NT]	21	114	112	2	92	74
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	[NT]	21	99	98	1	92	88
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	[NT]	21	82	99	19	90	85
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	[NT]	21	119	131	10	96	89

QUALITY CONTROL: PFAS in Soil Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	[NT]	43	17	24	34	[NT]	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	[NT]	43	12	18	40	[NT]	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	[NT]	43	2.7	3.3	20	[NT]	[NT]
6:2 FTS	µg/kg	0.1	Org-029	[NT]	43	<0.1	<0.1	0	[NT]	[NT]
8:2 FTS	µg/kg	0.2	Org-029	[NT]	43	<0.2	<0.2	0	[NT]	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	[NT]	43	102	100	2	[NT]	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	[NT]	43	97	93	4	[NT]	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	[NT]	43	87	83	5	[NT]	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	[NT]	43	86	85	1	[NT]	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	[NT]	43	90	96	6	[NT]	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	[NT]	43	85	87	2	[NT]	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	[NT]	43	76	92	19	[NT]	[NT]

QUALITY CONTROL: PFAS in Water Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	112	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	108	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	104	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	[NT]	[NT]	[NT]	[NT]	110	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	[NT]	[NT]	[NT]	[NT]	105	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	103	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	101	[NT]	[NT]	[NT]	[NT]	99	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	90	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	116	[NT]	[NT]	[NT]	[NT]	105	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PFAS: ## Matrix spike recovery is not possible to report for 33011-2 for PFOS and for 33011-47 for PFOS and PFHxS due to the high concentration of analytes in the sample/s have caused interference. However, an acceptable recovery was obtained for the LCS.

PQL has been raised for 33011-52 due to the sample matrix requiring dilution.

For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Dilara Valiff

Sample Login Details

Your reference	12583428-MFS Adelaide DSI
Envirolab Reference	33011
Date Sample Received	09/08/2022
Date Instructions Received	11/08/2022
Date Results Expected to be Reported	18/08/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	60 Soil, 2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

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Analysis Underway, details on the following page:

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Sample ID	PFAS in Soil Short	PFAS in Water Short	On Hold
BH05_0.1-0.2	✓		
BH05_0.4-0.5	✓		
BH05_1.0-1.1	✓		
BH05_1.5-1.6			✓
BH05_2.4-2.5			✓
BH06_0.1-0.2	✓		
BH06_0.4-0.5	✓		
BH06_1.0-1.1			✓
BH06_1.6-1.7			✓
BH06_2.4-2.5			✓
BH07_0.1-0.2			✓
BH07_0.4-0.5	✓		
BH07_0.9-1.0	✓		
BH07_1.3-1.4			✓
BH08_0.1-0.2	✓		
BH08_0.4-0.5	✓		
BH08_1.0-1.1			✓
BH08_1.6-1.7			✓
BH08_2.4-2.5			✓
BH09_0.1-0.2	✓		
BH09_0.4-0.5	✓		
BH09_1.1-1.2			✓
BH09_2.3-2.4			✓
BH09B_3.4-3.5			✓
BH11_0.1-0.2	✓		
BH11_0.4-0.5	✓		
BH12_0.1-0.2	✓		
BH12_0.4-0.5	✓		
BH12_1.0-1.1			✓
BH12_1.5-1.6			✓
BH12_2.4-2.5			✓
BH13_0.1-0.2	✓		

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
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Sample ID	PFAS in Soil Short	PFAS in Water Short	On Hold
BH13_0.4-0.5	✓		
BH13_0.9-1.0			✓
BH13_1.4-1.5			✓
BH13_2.3-2.4			✓
BH14_0.1-0.2	✓		
BH14_0.4-0.5	✓		
BH14_1.0-1.1			✓
BH14_1.6-1.7			✓
BH14_2.4-2.5			✓
BH15_0.1-0.2	✓		
BH15_0.4-0.5	✓		
BH15_0.9-1.0			✓
BH15_1.6-1.7			✓
BH15_2.4-2.5			✓
BH16_0.1-0.2	✓		
BH16_0.4-0.5	✓		
BH16_1.0-1.1			✓
BH16_1.6-1.7			✓
BH16_2.4-2.5			✓
BH18_0.2-0.3	✓		
BH18_0.5-0.6	✓		
BH18_1.0-1.1			✓
BH18_1.6-1.7			✓
BH18_2.4-2.5			✓
FD01	✓		
FD02	✓		
FD03	✓		
FD04			✓
RB01		✓	
RB02		✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

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Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

Karley Spence

33011-A

From: Matt Bald <Matt.Bald@ghd.com>
Sent: Friday, 19 August 2022 5:12 PM
To: MelbourneMailbox
Cc: Adelaide; Karley Spence; Alex Stenta; Dilara Valiff
Subject: GHD 12583428 - Batch 33011 - additional soil analysis request

Follow Up Flag: Follow up
Flag Status: Flagged

Hi Envirolab Team,

Could you please arrange analysis of the following **18 additional samples** (currently 'on hold') from batch 33011 for **'PFAS in Soil Short'**?

- BH05_1.5-1.6 #4
- BH05_2.4-2.5 #5
- BH06_1.0-1.1 #8
- BH06_1.6-1.7 #9
- BH07_1.3-1.4 #14
- BH08_1.0–1.1 #17
- BH08_1.6-1.7 #18
- BH09_1.1-1.2 #22
- BH12_1.0-1.1 #29
- BH12_1.5-1.6 #30
- BH13_0.9-1.0 #34
- BH13_1.4-1.5 #35
- BH14_1.0-1.1 #39
- BH14_1.6-1.7 #40
- BH15_0.9-1.0 #44
- BH16_1.0-1.1 #49
- BH16_1.6-1.7 #50
- FD04 #60

Could you also please arrange **leachability** analysis for the following **two** samples?

- BH07_0.4-0.5 #12
- BH07_0.9-1.0 #13

Any queries or additional information required regarding this request, please let me know.

Kind regards,
Matt

Matt Bald (he/him)
BSc (Hons)
Environmental Scientist

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CERTIFICATE OF ANALYSIS 33011-A

Client Details

Client	GHD SA
Attention	Matt Bald
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428-MFS Adelaide DSI**
Number of Samples	60 Soil, 2 Water
Date samples received	09/08/2022
Date completed instructions received	19/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Please refer to the last page of this report for any comments relating to the results.

Report Details

Date results requested by	26/08/2022
Date of Issue	26/08/2022

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Results Approved By
Chris De Luca, Operations Manager
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short						
Our Reference		33011-A-4	33011-A-5	33011-A-8	33011-A-9	33011-A-14
Your Reference	UNITS	BH05_1.5-1.6	BH05_2.4-2.5	BH06_1.0-1.1	BH06_1.6-1.7	BH07_1.3-1.4
Date Sampled		04/08/2022	04/08/2022	04/08/2022	04/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	14	25	26	32	360
Perfluorooctanesulfonic acid PFOS	µg/kg	61	16	690	380	2,000
Perfluorooctanoic acid PFOA	µg/kg	1.0	1.1	3.3	6.5	41
6:2 FTS	µg/kg	0.3	0.2	3.1	3.9	11
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	98	104	94	102	96
Surrogate $^{13}C_2$ PFOA	%	102	101	102	104	103
Extracted ISTD $^{18}O_2$ *PFHxS*	%	87	87	84	89	94
Extracted ISTD $^{13}C_4$ *PFOS*	%	82	89	105	101	102
Extracted ISTD $^{13}C_4$ *PFOA*	%	93	92	87	82	57
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	87	94	91	86	67
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	96	96	98	91	96
Total Positive PFHxS & PFOS	µg/kg	74	40	720	420	2,300
Total Positive PFOS & PFOA	µg/kg	62	17	700	390	2,000
Total Positive PFAS	µg/kg	76	42	730	430	2,400

PFAS in Soil Short						
Our Reference		33011-A-17	33011-A-18	33011-A-22	33011-A-29	33011-A-30
Your Reference	UNITS	BH08_1.0-1.1	BH08_1.6-1.7	BH09_1.1-1.2	BH12_1.0-1.1	BH12_1.5-1.6
Date Sampled		05/08/2022	05/08/2022	05/08/2022	04/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	170	76	11	2.7	3.2
Perfluorooctanesulfonic acid PFOS	µg/kg	360	6.8	720	400	53
Perfluorooctanoic acid PFOA	µg/kg	53	20	1.4	0.9	0.5
6:2 FTS	µg/kg	4.4	1.1	16	2.9	1.1
8:2 FTS	µg/kg	<0.2	<0.2	0.4	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	98	106	103	100	109
Surrogate $^{13}C_2$ PFOA	%	102	102	100	99	96
Extracted ISTD $^{18}O_2$ *PFHxS*	%	92	95	89	96	91
Extracted ISTD $^{13}C_4$ *PFOS*	%	99	90	98	107	86
Extracted ISTD $^{13}C_4$ *PFOA*	%	66	89	97	98	98
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	75	89	93	102	96
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	96	89	122	94	100
Total Positive PFHxS & PFOS	µg/kg	530	83	730	400	56
Total Positive PFOS & PFOA	µg/kg	420	27	720	400	53
Total Positive PFAS	µg/kg	590	100	750	400	58

PFAS in Soil Short						
Our Reference		33011-A-34	33011-A-35	33011-A-39	33011-A-40	33011-A-44
Your Reference	UNITS	BH13_0.9-1.0	BH13_1.4-1.5	BH14_1.0-1.1	BH14_1.6-1.7	BH15_0.9-1.0
Date Sampled		04/08/2022	04/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	27	32	11	38	21
Perfluorooctanesulfonic acid PFOS	µg/kg	13	50	68	400	2.1
Perfluorooctanoic acid PFOA	µg/kg	1.5	7.5	0.4	4.0	1.1
6:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	105	102	104	103	104
Surrogate $^{13}C_2$ PFOA	%	102	100	102	100	106
Extracted ISTD $^{18}O_2$ *PFHxS*	%	84	90	88	82	87
Extracted ISTD $^{13}C_4$ *PFOS*	%	88	88	95	99	89
Extracted ISTD $^{13}C_4$ *PFOA*	%	87	95	96	82	89
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	81	91	98	89	90
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	96	97	98	94	86
Total Positive PFHxS & PFOS	µg/kg	39	82	79	440	23
Total Positive PFOS & PFOA	µg/kg	14	58	68	410	3.2
Total Positive PFAS	µg/kg	41	90	79	440	24

PFAS in Soil Short				
Our Reference		33011-A-49	33011-A-50	33011-A-60
Your Reference	UNITS	BH16_1.0-1.1	BH16_1.6-1.7	FD04
Date Sampled		05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	3.8	0.8	2.2
Perfluorooctanesulfonic acid PFOS	µg/kg	160	9.5	35
Perfluorooctanoic acid PFOA	µg/kg	2.3	0.3	0.2
6:2 FTS	µg/kg	0.7	<0.1	<0.1
8:2 FTS	µg/kg	3.1	<0.2	0.3
Surrogate $^{13}C_8$ PFOS	%	99	106	110
Surrogate $^{13}C_2$ PFOA	%	102	106	102
Extracted ISTD $^{18}O_2$ PFHxS	%	92	94	93
Extracted ISTD $^{13}C_4$ PFOS	%	96	86	83
Extracted ISTD $^{13}C_4$ PFOA	%	97	92	101
Extracted ISTD $^{13}C_2$ 6:2FTS	%	92	98	94
Extracted ISTD $^{13}C_2$ 8:2FTS	%	90	90	91
Total Positive PFHxS & PFOS	µg/kg	160	10	37
Total Positive PFOS & PFOA	µg/kg	160	9.7	35
Total Positive PFAS	µg/kg	170	10	38

Moisture						
Our Reference		33011-A-4	33011-A-5	33011-A-8	33011-A-9	33011-A-14
Your Reference	UNITS	BH05_1.5-1.6	BH05_2.4-2.5	BH06_1.0-1.1	BH06_1.6-1.7	BH07_1.3-1.4
Date Sampled		04/08/2022	04/08/2022	04/08/2022	04/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Moisture	%	27	29	28	21	16

Moisture						
Our Reference		33011-A-17	33011-A-18	33011-A-22	33011-A-29	33011-A-30
Your Reference	UNITS	BH08_1.0-1.1	BH08_1.6-1.7	BH09_1.1-1.2	BH12_1.0-1.1	BH12_1.5-1.6
Date Sampled		05/08/2022	05/08/2022	05/08/2022	04/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Moisture	%	26	22	23	15	20

Moisture						
Our Reference		33011-A-34	33011-A-35	33011-A-39	33011-A-40	33011-A-44
Your Reference	UNITS	BH13_0.9-1.0	BH13_1.4-1.5	BH14_1.0-1.1	BH14_1.6-1.7	BH15_0.9-1.0
Date Sampled		04/08/2022	04/08/2022	05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022	24/08/2022	24/08/2022
Moisture	%	13	27	22	28	24

Moisture				
Our Reference		33011-A-49	33011-A-50	33011-A-60
Your Reference	UNITS	BH16_1.0-1.1	BH16_1.6-1.7	FD04
Date Sampled		05/08/2022	05/08/2022	05/08/2022
Type of sample		Soil	Soil	Soil
Date prepared	-	23/08/2022	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022	24/08/2022
Moisture	%	21	23	8.8

PFAS in ASLP			
Our Reference	UNITS	33011-A-12	33011-A-13
Your Reference		BH07_0.4-0.5	BH07_0.9-1.0
Date Sampled		05/08/2022	05/08/2022
Type of sample		Soil	Soil
Date prepared	-	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022
Extraction fluid used	-	1	1
pH of final Leachate	pH units	6.1	6.2
Perfluorohexanesulfonic acid PFHxS	µg/L	1.4	13
Perfluorooctanesulfonic acid PFOS	µg/L	190	130
Perfluorooctanoic acid PFOA	µg/L	0.13	0.79
6:2 FTS	µg/L	2.7	2.3
8:2 FTS	µg/L	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	99	100
Surrogate $^{13}C_2$ PFOA	%	101	103
Extracted ISTD 18O2 PFHxS	%	95	91
Extracted ISTD 13C4 PFOS	%	97	96
Extracted ISTD $^{13}C_4$ *PFOA*	%	99	90
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	88	92
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	111	107
Total Positive PFHxS & PFOS	µg/L	190	140
Total Positive PFOS & PFOA	µg/L	190	130
Total Positive PFAS	µg/L	200	150

PFAS in TCLP Short			
Our Reference	UNITS	33011-A-12	33011-A-13
Your Reference		BH07_0.4-0.5	BH07_0.9-1.0
Date Sampled		05/08/2022	05/08/2022
Type of sample		Soil	Soil
Date prepared	-	23/08/2022	23/08/2022
Date analysed	-	24/08/2022	24/08/2022
Extraction fluid used	-	[NT]	[NT]
pH of final Leachate	pH units	8.4	8.6
Perfluorohexanesulfonic acid PFHxS	µg/L	1.9	12
Perfluorooctanesulfonic acid PFOS	µg/L	320	98
Perfluorooctanoic acid PFOA	µg/L	0.17	0.75
6:2 FTS	µg/L	3.5	2.0
8:2 FTS	µg/L	<0.02	<0.02
Surrogate $^{13}C_8$ PFOS	%	99	103
Surrogate $^{13}C_2$ PFOA	%	103	102
Extracted ISTD $^{18}O_2$ *PFHxS*	%	93	97
Extracted ISTD $^{13}C_4$ *PFOS*	%	92	98
Extracted ISTD $^{13}C_4$ *PFOA*	%	96	94
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	89	99
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	104	103
Total Positive PFHxS & PFOS	µg/L	320	110
Total Positive PFOS & PFOA	µg/L	320	98
Total Positive PFAS	µg/L	320	110

Method ID	Methodology Summary
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only as analysis outside of the APHA storage times.
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER
Org-029A	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33011-A-22
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	18	76	72	5	100	105
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	18	6.8	5.2	27	97	##
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	18	20	19	5	94	101
6:2 FTS	µg/kg	0.1	Org-029	<0.1	18	1.1	1.1	0	106	113
8:2 FTS	µg/kg	0.2	Org-029	<0.2	18	<0.2	<0.2	0	103	119
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	18	106	102	4	94	108
Surrogate $^{13}C_2$ PFOA	%		Org-029	103	18	102	104	2	102	100
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	98	18	95	80	17	95	87
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	100	18	90	93	3	99	36
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	105	18	89	88	1	100	93
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	100	18	89	85	5	97	89
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	101	18	89	92	3	98	99

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	[NT]	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	[NT]	50	0.8	0.7	13	[NT]	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	[NT]	50	9.5	11	15	[NT]	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	[NT]	50	0.3	0.2	40	[NT]	[NT]
6:2 FTS	µg/kg	0.1	Org-029	[NT]	50	<0.1	<0.1	0	[NT]	[NT]
8:2 FTS	µg/kg	0.2	Org-029	[NT]	50	<0.2	<0.2	0	[NT]	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	[NT]	50	106	111	5	[NT]	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	[NT]	50	106	99	7	[NT]	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	[NT]	50	94	90	4	[NT]	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	[NT]	50	86	88	2	[NT]	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	[NT]	50	92	95	3	[NT]	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	[NT]	50	98	94	4	[NT]	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	[NT]	50	90	96	6	[NT]	[NT]

QUALITY CONTROL: PFAS in ASLP						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33011-A-13
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	12	1.4	1.4	0	111	123
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	12	190	190	0	114	##
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	12	0.13	0.12	8	106	111
6:2 FTS	µg/L	0.01	Org-029	<0.01	12	2.7	2.8	4	113	117
8:2 FTS	µg/L	0.02	Org-029	<0.02	12	<0.02	<0.02	0	115	123
Surrogate $^{13}C_8$ PFOS	%		Org-029	102	12	99	103	4	106	100
Surrogate $^{13}C_2$ PFOA	%		Org-029	100	12	101	100	1	104	103
Extracted ISTD 18O2 PFHxS	%		Org-029	96	12	95	94	1	92	83
Extracted ISTD 13C4 PFOS	%		Org-029	104	12	97	101	4	97	70
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	109	12	99	101	2	98	89
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	103	12	88	87	1	105	90
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	110	12	111	105	6	96	93

QUALITY CONTROL: PFAS in TCLP Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33011-A-13
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029A	<0.01	12	1.9	2.0	5	109	88
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029A	<0.01	12	320	290	10	111	##
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029A	<0.01	12	0.17	0.19	11	104	108
6:2 FTS	µg/L	0.01	Org-029A	<0.01	12	3.5	3.6	3	117	109
8:2 FTS	µg/L	0.02	Org-029A	<0.02	12	<0.02	<0.02	0	119	116
Surrogate $^{13}C_8$ PFOS	%		Org-029A	101	12	99	103	4	106	98
Surrogate $^{13}C_2$ PFOA	%		Org-029A	104	12	103	105	2	99	100
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029A	97	12	93	93	0	92	81
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029A	100	12	92	96	4	97	79
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029A	103	12	96	92	4	100	89
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029A	106	12	89	87	2	101	97
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029A	105	12	104	105	1	95	99

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Report Comments

PFAS: For PFAS Extracted Internal Standards denoted with # or outside the 50-150% acceptance range, the respective target analyte results may be unaffected, in other circumstances the PQL has been raised to accommodate the outlier(s).

Matrix spike recovery is not possible to report for 33011-A-13 and 33011-A-22 for PFOS due to the high concentration of analytes in the sample/s have caused interference. However, an acceptable recovery was obtained for the LCS.

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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Matt Bald

Sample Login Details

Your reference	12583428-MFS Adelaide DSI
Envirolab Reference	33011-A
Date Sample Received	09/08/2022
Date Instructions Received	19/08/2022
Date Results Expected to be Reported	26/08/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	60 Soil, 2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	PFAS in Soil Short	PFAS in ASLP	On Hold
BH05_0.1-0.2			✓
BH05_0.4-0.5			✓
BH05_1.0-1.1			✓
BH05_1.5-1.6	✓		
BH05_2.4-2.5	✓		
BH06_0.1-0.2			✓
BH06_0.4-0.5			✓
BH06_1.0-1.1	✓		
BH06_1.6-1.7	✓		
BH06_2.4-2.5			✓
BH07_0.1-0.2			✓
BH07_0.4-0.5		✓	
BH07_0.9-1.0		✓	
BH07_1.3-1.4	✓		
BH08_0.1-0.2			✓
BH08_0.4-0.5			✓
BH08_1.0-1.1	✓		
BH08_1.6-1.7	✓		
BH08_2.4-2.5			✓
BH09_0.1-0.2			✓
BH09_0.4-0.5			✓
BH09_1.1-1.2	✓		
BH09_2.3-2.4			✓
BH09B_3.4-3.5			✓
BH11_0.1-0.2			✓
BH11_0.4-0.5			✓
BH12_0.1-0.2			✓
BH12_0.4-0.5			✓
BH12_1.0-1.1	✓		
BH12_1.5-1.6	✓		
BH12_2.4-2.5			✓
BH13_0.1-0.2			✓

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Sample ID	PFAS in Soil Short	PFAS in ASLP	On Hold
BH13_0.4-0.5			✓
BH13_0.9-1.0	✓		
BH13_1.4-1.5	✓		
BH13_2.3-2.4			✓
BH14_0.1-0.2			✓
BH14_0.4-0.5			✓
BH14_1.0-1.1	✓		
BH14_1.6-1.7	✓		
BH14_2.4-2.5			✓
BH15_0.1-0.2			✓
BH15_0.4-0.5			✓
BH15_0.9-1.0	✓		
BH15_1.6-1.7			✓
BH15_2.4-2.5			✓
BH16_0.1-0.2			✓
BH16_0.4-0.5			✓
BH16_1.0-1.1	✓		
BH16_1.6-1.7	✓		
BH16_2.4-2.5			✓
BH18_0.2-0.3			✓
BH18_0.5-0.6			✓
BH18_1.0-1.1			✓
BH18_1.6-1.7			✓
BH18_2.4-2.5			✓
FD01			✓
FD02			✓
FD03			✓
FD04	✓		
RB01			✓
RB02			✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

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Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

33011 - B

Gemma Sliz

From: Steven Castillo <Steven.Castillo@ghd.com>
Sent: Tuesday, 30 August 2022 9:44 AM
To: MelbourneMailbox
Cc: Alex Stenta; Adelaide; Dilara Valiff; Matt Bald
Subject: GHD 12583428 - Batch 33011 / 33104 - Additional Soil Analysis Request

Hi Envirolab team,

Could you please arrange analysis of the following **8 additional samples** (currently 'on hold') from batch 33011 / 33104 for **'PFAS in Soil Short'**? Just standard TAT is fine.

- BH06_2.4-2.5 #10
- BH08_2.4-2.5 #19
- BH09_2.3-2.4 #23
- BH09B_3.4-3.5 #24
- BH10_1.3-1.4
- BH12_2.4-2.5 #31
- BH13_2.3-2.4 #36
- BH14_2.4-2.5 #41

Any additional info required, please let me know.

Thank you,

Steven Castillo (he/him)
BSc (Hons) Environmental Science
Graduate Environmental Scientist

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→ The Power of Commitment
Connect

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CERTIFICATE OF ANALYSIS 33011-B

Client Details

Client	GHD SA
Attention	Steven Castillo
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428-MFS Adelaide DSI**
Number of Samples	60 Soil, 2 Water
Date samples received	09/08/2022
Date completed instructions received	30/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	06/09/2022
Date of Issue	05/09/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Chris De Luca, Operations Manager
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short						
Our Reference		33011-B-10	33011-B-19	33011-B-23	33011-B-24	33011-B-31
Your Reference	UNITS	BH06_2.4-2.5	BH08_2.4-2.5	BH09_2.3-2.4	BH09B_3.4-3.5	BH12_2.4-2.5
Date Sampled		04/08/2022	05/08/2022	05/08/2022	05/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/09/2022	02/09/2022	02/09/2022	02/09/2022	02/09/2022
Date analysed	-	02/09/2022	02/09/2022	02/09/2022	02/09/2022	02/09/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	20	85	29	6.6	3.7
Perfluorooctanesulfonic acid PFOS	µg/kg	21	44	960	6.6	57
Perfluorooctanoic acid PFOA	µg/kg	1.7	6.4	3.4	0.5	0.6
6:2 FTS	µg/kg	6.9	3.9	42	0.4	1.4
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	89	97	101	93	91
Surrogate $^{13}C_2$ PFOA	%	103	98	100	99	102
Extracted ISTD $^{18}O_2$ *PFHxS*	%	79	93	79	84	83
Extracted ISTD $^{13}C_4$ *PFOS*	%	89	83	101	88	81
Extracted ISTD $^{13}C_4$ *PFOA*	%	86	86	91	91	86
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	78	82	82	81	83
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	86	84	94	85	86
Total Positive PFHxS & PFOS	µg/kg	41	130	990	13	61
Total Positive PFOS & PFOA	µg/kg	23	50	970	7.1	58
Total Positive PFAS	µg/kg	49	140	1,000	14	63

PFAS in Soil Short			
Our Reference		33011-B-36	33011-B-41
Your Reference	UNITS	BH13_2.3-2.4	BH14_2.4-2.5
Date Sampled		04/08/2022	05/08/2022
Type of sample		Soil	Soil
Date prepared	-	02/09/2022	02/09/2022
Date analysed	-	02/09/2022	02/09/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	35	8.2
Perfluorooctanesulfonic acid PFOS	µg/kg	67	13
Perfluorooctanoic acid PFOA	µg/kg	1.7	0.7
6:2 FTS	µg/kg	0.1	0.2
8:2 FTS	µg/kg	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	99	99
Surrogate $^{13}C_2$ PFOA	%	104	98
Extracted ISTD $^{18}O_2$ PFHxS	%	79	85
Extracted ISTD $^{13}C_4$ PFOS	%	98	92
Extracted ISTD $^{13}C_4$ PFOA	%	88	94
Extracted ISTD $^{13}C_2$ 6:2FTS	%	86	86
Extracted ISTD $^{13}C_2$ 8:2FTS	%	91	95
Total Positive PFHxS & PFOS	µg/kg	100	21
Total Positive PFOS & PFOA	µg/kg	68	14
Total Positive PFAS	µg/kg	100	22

Moisture						
Our Reference		33011-B-10	33011-B-19	33011-B-23	33011-B-24	33011-B-31
Your Reference	UNITS	BH06_2.4-2.5	BH08_2.4-2.5	BH09_2.3-2.4	BH09B_3.4-3.5	BH12_2.4-2.5
Date Sampled		04/08/2022	05/08/2022	05/08/2022	05/08/2022	04/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	02/09/2022	02/09/2022	02/09/2022	02/09/2022	02/09/2022
Date analysed	-	03/09/2022	03/09/2022	03/09/2022	03/09/2022	03/09/2022
Moisture	%	26	21	20	21	24

Moisture			
Our Reference		33011-B-36	33011-B-41
Your Reference	UNITS	BH13_2.3-2.4	BH14_2.4-2.5
Date Sampled		04/08/2022	05/08/2022
Type of sample		Soil	Soil
Date prepared	-	02/09/2022	02/09/2022
Date analysed	-	03/09/2022	03/09/2022
Moisture	%	21	19

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33011-B-10
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	108	98
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	92	129
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	104	110
6:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	111	118
8:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	104	114
Surrogate $^{13}C_8$ PFOS	%		Org-029	91	[NT]	[NT]	[NT]	[NT]	84	93
Surrogate $^{13}C_2$ PFOA	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	99	101
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	94	[NT]	[NT]	[NT]	[NT]	90	77
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	101	81
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	100	[NT]	[NT]	[NT]	[NT]	96	81
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	95	[NT]	[NT]	[NT]	[NT]	90	73
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	99	81

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Envirolab Services Pty Ltd
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melbourne@envirolab.com.au
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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Steven Castillo

Sample Login Details

Your reference	12583428-MFS Adelaide DSI
Envirolab Reference	33011-B
Date Sample Received	09/08/2022
Date Instructions Received	30/08/2022
Date Results Expected to be Reported	06/09/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	60 Soil, 2 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	8.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

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Sample ID	PFAS in Soil Short	On Hold
BH05_0.1-0.2		✓
BH05_0.4-0.5		✓
BH05_1.0-1.1		✓
BH05_1.5-1.6		✓
BH05_2.4-2.5		✓
BH06_0.1-0.2		✓
BH06_0.4-0.5		✓
BH06_1.0-1.1		✓
BH06_1.6-1.7		✓
BH06_2.4-2.5	✓	
BH07_0.1-0.2		✓
BH07_0.4-0.5		✓
BH07_0.9-1.0		✓
BH07_1.3-1.4		✓
BH08_0.1-0.2		✓
BH08_0.4-0.5		✓
BH08_1.0-1.1		✓
BH08_1.6-1.7		✓
BH08_2.4-2.5	✓	
BH09_0.1-0.2		✓
BH09_0.4-0.5		✓
BH09_1.1-1.2		✓
BH09_2.3-2.4	✓	
BH09B_3.4-3.5	✓	
BH11_0.1-0.2		✓
BH11_0.4-0.5		✓
BH12_0.1-0.2		✓
BH12_0.4-0.5		✓
BH12_1.0-1.1		✓
BH12_1.5-1.6		✓
BH12_2.4-2.5	✓	
BH13_0.1-0.2		✓

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www.envirolab.com.au

Sample ID	PFAS in Soil Short	On Hold
BH13_0.4-0.5		✓
BH13_0.9-1.0		✓
BH13_1.4-1.5		✓
BH13_2.3-2.4	✓	
BH14_0.1-0.2		✓
BH14_0.4-0.5		✓
BH14_1.0-1.1		✓
BH14_1.6-1.7		✓
BH14_2.4-2.5	✓	
BH15_0.1-0.2		✓
BH15_0.4-0.5		✓
BH15_0.9-1.0		✓
BH15_1.6-1.7		✓
BH15_2.4-2.5		✓
BH16_0.1-0.2		✓
BH16_0.4-0.5		✓
BH16_1.0-1.1		✓
BH16_1.6-1.7		✓
BH16_2.4-2.5		✓
BH18_0.2-0.3		✓
BH18_0.5-0.6		✓
BH18_1.0-1.1		✓
BH18_1.6-1.7		✓
BH18_2.4-2.5		✓
FD01		✓
FD02		✓
FD03		✓
FD04		✓
RB01		✓
RB02		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

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Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

CHAIN OF CUSTODY FORM - Client

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Melbourne Lab - Envirolab Services
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03 9763 2600 | melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
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08 7087 6800 | adelaide@envirolab.com.au

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20a, 10-20 Depot St, Banyo, QLD 4014
07 3266 9532 | brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Soil
Contact Person: Matt Bald	
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com dilara.valiff@ghd.com matt.bald@ghd.com ally.kirkman@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	BH10_0.1-0.2	1P	11/08/2022	Soil	x															
2	BH10_0.4-0.5	1P	11/08/2022	Soil	x															
3	BH10_0.9-1.0	2P	11/08/2022	Soil	x															
4	BH10_1.3-1.4	1P	11/08/2022	Soil						x										
5	BH17_0.1-0.2	1P	11/08/2022	Soil	x															
6	BH17_0.4-0.5	1P	11/08/2022	Soil	x															
7	RB03	2P	11/8/22	water																

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS Melb	*Lab Use Only*
Print Name: Matt Bald	Print Name: L Olsen	Job number: 331104 — Cooling: Ice / Ice pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 17/8/22 8:10am	Temperature: 7.1°C — Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

COC received 1.17pm 17/8/22

Gemma Sliz

From: Matt Bald <Matt.Bald@ghd.com>
Sent: Wednesday, 17 August 2022 1:33 PM
To: Adelaide; Sarah Stopic; MelbourneMailbox
Cc: Dilara Valiff
Subject: RE: Sample Receipt for 33105 12583428 - MFS Adelaide DSI - Sediment

Hi All,

Please add RB03 (water, 2P) to batch 33104 and analyse for PFAS (Short Suite).

Kind regards,
Matt

Matt Bald (he/him)
BSc (Hons)
Environmental Scientist

GHD
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Level 4, 211 Victoria Square, Adelaide SA 5000, Australia
D +61 8 8111 6712 M +61 423 876 470 E matt.bald@ghd.com

From: Adelaide <adelaide@envirolab.com.au>
Sent: Wednesday, 17 August 2022 12:56 PM
To: Dilara Valiff <Dilara.Valiff@ghd.com>; Sarah Stopic <SStopic@envirolab.com.au>; MelbourneMailbox <Melbourne@envirolab.com.au>
Cc: Matt Bald <Matt.Bald@ghd.com>; Adelaide <adelaide@envirolab.com.au>
Subject: RE: Sample Receipt for 33105 12583428 - MFS Adelaide DSI - Sediment

Hi Dilara,

Sample RB03 does not appear on any of the COCs, do you require this sample analysed and which COC does it relate to?

Kind Regards,

Adelaide | Reception | Envirolab Services

Great Science. Great Service.

CHAIN OF CUSTODY FORM - Client

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① 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Soil
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No.:
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	BH10_0.1-0.2	1P	11/08/2022	Soil						x										
2	BH10_0.4-0.5	1P	11/08/2022	Soil						x										
3	BH10_0.9-1.0	2P	11/08/2022	Soil						x										
4	BH10_1.3-1.4	1P	11/08/2022	Soil						x										
5	BH17_0.1-0.2	1P	11/08/2022	Soil						x										
6	BH17_0.4-0.5	1P	11/08/2022	Soil						x										

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS	Lab Use Only	
Print Name: Matt Bald	Print Name: S. Stasic	Job number: 33104	Cooling: Ice / Ice pack / None
Date & Time: 16/08/2022; 1530	Date & Time: 16/8/22 5.10pm	Temperature: 7.1°c	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

COC received 3:13pm 16/8/22

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CERTIFICATE OF ANALYSIS 33104

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428 - MFS Adelaide DSI - Soil**
Number of Samples	6 Soil, 1 Water
Date samples received	16/08/2022
Date completed instructions received	17/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	23/08/2022
Date of Issue	23/08/2022

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Results Approved By
Chris De Luca, Operations Manager
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short						
Our Reference		33104-1	33104-2	33104-3	33104-5	33104-6
Your Reference	UNITS	BH10_0.1-0.2	BH10_0.4-0.5	BH10_0.9-1.0	BH17_0.1-0.2	BH17_0.4-0.5
Date Sampled		11/08/2022	11/08/2022	11/08/2022	11/08/2022	11/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	1.8	0.2	0.6	0.1	0.4
Perfluorooctanesulfonic acid PFOS	µg/kg	39	19	51	4.0	12
Perfluorooctanoic acid PFOA	µg/kg	0.2	<0.1	<0.1	<0.1	0.2
6:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	115	106	96	108	107
Surrogate $^{13}C_2$ PFOA	%	102	105	102	105	107
Extracted ISTD $^{18}O_2$ *PFHxS*	%	93	95	94	93	95
Extracted ISTD $^{13}C_4$ *PFOS*	%	83	90	109	96	96
Extracted ISTD $^{13}C_4$ *PFOA*	%	99	97	96	100	103
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	94	94	89	97	101
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	103	90	86	109	118
Total Positive PFHxS & PFOS	µg/kg	41	19	52	4.1	13
Total Positive PFOS & PFOA	µg/kg	39	19	51	4.0	12
Total Positive PFAS	µg/kg	41	19	52	4.1	13

Moisture						
Our Reference		33104-1	33104-2	33104-3	33104-5	33104-6
Your Reference	UNITS	BH10_0.1-0.2	BH10_0.4-0.5	BH10_0.9-1.0	BH17_0.1-0.2	BH17_0.4-0.5
Date Sampled		11/08/2022	11/08/2022	11/08/2022	11/08/2022	11/08/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Date analysed	-	19/08/2022	19/08/2022	19/08/2022	19/08/2022	19/08/2022
Moisture	%	24	12	18	17	13

PFAS in Water Short		
Our Reference	UNITS	33104-7
Your Reference		RB03
Date Sampled		11/08/2022
Type of sample		Water
Date prepared	-	18/08/2022
Date analysed	-	18/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	<0.01
Perfluorooctanoic acid PFOA	µg/L	<0.01
6:2 FTS	µg/L	<0.01
8:2 FTS	µg/L	<0.02
Surrogate $^{13}C_8$ PFOS	%	105
Surrogate $^{13}C_2$ PFOA	%	102
Extracted ISTD $^{18}O_2$ *PFHxS*	%	90
Extracted ISTD $^{13}C_4$ *PFOS*	%	91
Extracted ISTD $^{13}C_4$ *PFOA*	%	93
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	94
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	100
Total Positive PFHxS & PFOS	µg/L	<0.01
Total Positive PFOS & PFOA	µg/L	<0.01
Total Positive PFAS	µg/L	<0.01

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	6	0.4	0.5	22	100	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	6	12	15	22	105	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	6	0.2	0.2	0	102	[NT]
6:2 FTS	µg/kg	0.1	Org-029	<0.1	6	<0.1	<0.1	0	101	[NT]
8:2 FTS	µg/kg	0.2	Org-029	<0.2	6	<0.2	<0.2	0	114	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	6	107	104	3	101	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	105	6	107	102	5	103	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	105	6	95	102	7	98	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	104	6	96	100	4	94	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	110	6	103	108	5	98	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	99	6	101	109	8	93	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	102	6	118	125	6	85	[NT]

QUALITY CONTROL: PFAS in Water Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	7	<0.01	<0.01	0	107	[NT]
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	7	<0.01	<0.01	0	114	[NT]
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	7	<0.01	<0.01	0	111	[NT]
6:2 FTS	µg/L	0.01	Org-029	<0.01	7	<0.01	<0.01	0	106	[NT]
8:2 FTS	µg/L	0.02	Org-029	<0.02	7	<0.02	<0.02	0	116	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	109	7	105	112	6	113	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	102	7	102	102	0	102	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	89	7	90	94	4	90	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	91	7	91	90	1	85	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	96	7	93	96	3	90	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	92	7	94	98	4	93	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	95	7	100	95	5	89	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Dilara Valiff

Sample Login Details

Your reference	12583428 - MFS Adelaide DSI - Soil
Envirolab Reference	33104
Date Sample Received	16/08/2022
Date Instructions Received	17/08/2022
Date Results Expected to be Reported	23/08/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 Soil, 1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.1
Cooling Method	Icepack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
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melbourne@envirolab.com.au
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Sample ID	PFAS in Soil Short	PFAS in Water Short	On Hold
BH10_0.1-0.2	✓		
BH10_0.4-0.5	✓		
BH10_0.9-1.0	✓		
BH10_1.3-1.4			✓
BH17_0.1-0.2	✓		
BH17_0.4-0.5	✓		
RB03		✓	

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

33104 - A

Sample Receipt Melbourne

From: Steven Castillo <Steven.Castillo@ghd.com>
Sent: Tuesday, 30 August 2022 9:44 AM
To: MelbourneMailbox
Cc: Alex Stenta; Adelaide; Dilara Valiff; Matt Bald
Subject: GHD 12583428 - Batch 33011 / 33104 - Additional Soil Analysis Request

Hi Envirolab team,

Could you please arrange analysis of the following **8 additional samples** (currently 'on hold') from batch 33011 / 33104 for **'PFAS in Soil Short'**? Just standard TAT is fine.

- BH06_2.4-2.5
- BH08_2.4-2.5
- BH09_2.3-2.4
- BH09B_3.4-3.5
- BH10_1.3-1.4 #4
- BH12_2.4-2.5
- BH13_2.3-2.4
- BH14_2.4-2.5

Any additional info required, please let me know.

Thank you,

Steven Castillo (he/him)
BSc (Hons) Environmental Science
Graduate Environmental Scientist

GHD
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Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6832 **M** +61 408 004 659 **E** steven.castillo@ghd.com

→ **The Power of Commitment**

Connect

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ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33104-A

Client Details

Client	GHD SA
Attention	Matt Bald
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428 - MFS Adelaide DSI - Soil**
Number of Samples	6 Soil, 1 Water
Date samples received	16/08/2022
Date completed instructions received	30/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	06/09/2022
Date of Issue	05/09/2022

NATA Accreditation Number 2901. This document shall not be reproduced except in full.

Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Chris De Luca, Operations Manager
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short		
Our Reference		33104-A-4
Your Reference	UNITS	BH10_1.3-1.4
Date Sampled		11/08/2022
Type of sample		Soil
Date prepared	-	02/09/2022
Date analysed	-	02/09/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.7
Perfluorooctanesulfonic acid PFOS	µg/kg	110
Perfluorooctanoic acid PFOA	µg/kg	<0.1
6:2 FTS	µg/kg	<0.1
8:2 FTS	µg/kg	<0.2
Surrogate $^{13}C_8$ PFOS	%	97
Surrogate $^{13}C_2$ PFOA	%	99
Extracted ISTD $^{18}O_2$ PFHxS	%	84
Extracted ISTD $^{13}C_4$ PFOS	%	96
Extracted ISTD $^{13}C_4$ PFOA	%	94
Extracted ISTD $^{13}C_2$ 6:2FTS	%	86
Extracted ISTD $^{13}C_2$ 8:2FTS	%	86
Total Positive PFHxS & PFOS	µg/kg	110
Total Positive PFOS & PFOA	µg/kg	110
Total Positive PFAS	µg/kg	110

Moisture		
Our Reference		33104-A-4
Your Reference	UNITS	BH10_1.3-1.4
Date Sampled		11/08/2022
Type of sample		Soil
Date prepared	-	02/09/2022
Date analysed	-	03/09/2022
Moisture	%	22

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	4	0.7	0.7	0	108	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	4	110	110	0	92	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	4	<0.1	<0.1	0	104	[NT]
6:2 FTS	µg/kg	0.1	Org-029	<0.1	4	<0.1	<0.1	0	111	[NT]
8:2 FTS	µg/kg	0.2	Org-029	<0.2	4	<0.2	<0.2	0	104	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	91	4	97	98	1	84	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	99	4	99	100	1	99	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	94	4	84	84	0	90	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	99	4	96	95	1	101	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	100	4	94	88	7	96	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	95	4	86	80	7	90	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	99	4	86	89	3	99	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

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For VOCs in water samples, three vials are required for duplicate or spike analysis.

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Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

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Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Matt Bald

Sample Login Details

Your reference	12583428 - MFS Adelaide DSI - Soil
Envirolab Reference	33104-A
Date Sample Received	16/08/2022
Date Instructions Received	30/08/2022
Date Results Expected to be Reported	06/09/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	6 Soil, 1 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.1
Cooling Method	Icepack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

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25 Research Drive Croydon South VIC 3136
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melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Soil Short	On Hold
BH10_0.1-0.2		✓
BH10_0.4-0.5		✓
BH10_0.9-1.0		✓
BH10_1.3-1.4	✓	
BH17_0.1-0.2		✓
BH17_0.4-0.5		✓
RB03		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2215769**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 17-Aug-2022 16:05
Order number	: ----	Date Analysis Commenced	: 18-Aug-2022
C-O-C number	: ----	Issue Date	: 22-Aug-2022 10:39
Sampler	: MB/AK		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	FS01	----	----	----	----
				Sampling date / time	12-Aug-2022 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EM2215769-001	--------	--------	--------	--------
					Result	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		**0.02**	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L		**0.14**	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L		**3.59**	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L		<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L		<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L		**0.08**	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L		<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L		**0.03**	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		**0.11**	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		**0.07**	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		**3.73**	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		**4.04**	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		**81.5**	----	----	----	----
13C8-PFOA	----	0.02	%		**98.1**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **EM2215769**	Page	: 1 of 3
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: ----	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 17-Aug-2022
Order number	: ----	Date Analysis Commenced	: 18-Aug-2022
C-O-C number	: ----	Issue Date	: 22-Aug-2022
Sampler	: MB/AK		
Site	:		
Quote number	: EN/005		
No. of samples received	: 1		
No. of samples analysed	: 1		

Accreditation No. 825
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ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Xing Lin	Senior Organic Chemist	Melbourne Organics, Springvale, VIC

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

- **No Laboratory Duplicate (DUP) Results are required to be reported.**

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 4525824)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.222 µg/L	102	72.0	130
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.01	µg/L	<0.01	0.228 µg/L	97.1	68.0	131
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.232 µg/L	89.2	65.0	140
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 4525824)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	109	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	96.1	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	95.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	99.7	71.0	133
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 4525824)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.234 µg/L	96.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.238 µg/L	109	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.24 µg/L	80.7	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.242 µg/L	80.1	70.0	130
EP231P: PFAS Sums (QCLot: 4525824)								
EP231X: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.01	µg/L	<0.01	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

- **No Matrix Spike (MS) or Matrix Spike Duplicate (MSD) Results are required to be reported.**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EM2215769**	Page	: 1 of 4
Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Telephone	: +6138549 9645
Project	: 12583428	Date Samples Received	: 17-Aug-2022
Site	:	Issue Date	: 22-Aug-2022
Sampler	: MB/AK	No. of samples received	: 1
Order number	: ----	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count QC	Count Regular	Rate (%) Actual	Rate (%) Expected	Quality Control Specification
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / ***Container*** / Client Sample ID(s)	***Sample Date***	*Extraction / Preparation* ***Date extracted***	*Due for extraction*	*Evaluation*	*Analysis* ***Date analysed***	*Due for analysis*	*Evaluation*
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) FS01	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	08-Feb-2023	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) FS01	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	08-Feb-2023	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) FS01	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	08-Feb-2023	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) FS01	**12-Aug-2022**	**18-Aug-2022**	08-Feb-2023	✓	**18-Aug-2022**	08-Feb-2023	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	**0.00**	**5.00**	×	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EM2215769**

Client	: **GHD PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: DILARA VALIFF	Contact	: Peter Ravlic
Address	: 2/11 VICTORIA SQUARE ADELAIDE SA, AUSTRALIA 5000	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: dilara.valiff@ghd.com	E-mail	: peter.ravlic@alsglobal.com
Telephone	: ----	Telephone	: +6138549 9645
Facsimile	: ----	Facsimile	: +61-3-8549 9626
Project	: 12583428	Page	: 1 of 3
Order number	: ----	Quote number	: EB2020GHDSER0038 (EN/005)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	:		
Sampler	: MB/AK		

Dates

Date Samples Received	: 17-Aug-2022 16:05	Issue Date	: 17-Aug-2022
Client Requested Due Date	: 24-Aug-2022	Scheduled Reporting Date	: **24-Aug-2022**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 15.6°C - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Sample(s) received in non-ALS container(s).**
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231 PFAS - Short Suite (12 analytes)
EM2215769-001	12-Aug-2022 00:00	FS01	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ACCOUNTS PAYABLE

- A4 - AU Tax Invoice (INV)	Email	accountspayableAU@ghd.com

ALLY KIRKMAN

- *AU Certificate of Analysis - NATA (COA)	Email	ally.kirkman@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ally.kirkman@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ally.kirkman@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ally.kirkman@ghd.com
- Chain of Custody (CoC) (COC)	Email	ally.kirkman@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ally.kirkman@ghd.com
- EDI Format - XTab (XTAB)	Email	ally.kirkman@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ally.kirkman@ghd.com

DILARA VALIFF

- *AU Certificate of Analysis - NATA (COA)	Email	dilara.valiff@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	dilara.valiff@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	dilara.valiff@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	dilara.valiff@ghd.com
- A4 - AU Tax Invoice (INV)	Email	dilara.valiff@ghd.com
- Chain of Custody (CoC) (COC)	Email	dilara.valiff@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	dilara.valiff@ghd.com
- EDI Format - XTab (XTAB)	Email	dilara.valiff@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	dilara.valiff@ghd.com

GHD LAB REPORTS

- *AU Certificate of Analysis - NATA (COA)	Email	ghdlabreports@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	ghdlabreports@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	ghdlabreports@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	ghdlabreports@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	ghdlabreports@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	ghdlabreports@ghd.com

MATTHEW BALD

- *AU Certificate of Analysis - NATA (COA)	Email	matt.bald@ghd.com
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	matt.bald@ghd.com
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	matt.bald@ghd.com
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	matt.bald@ghd.com
- Chain of Custody (CoC) (COC)	Email	matt.bald@ghd.com
- EDI Format - ESDAT (ESDAT)	Email	matt.bald@ghd.com
- EDI Format - XTab (XTAB)	Email	matt.bald@ghd.com
- Electronic SRN for ESdat (ESRN_ESDAT)	Email	matt.bald@ghd.com

CHAIN OF CUSTODY FORM - Client

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Environmental Division
Melbourne
Work Order Reference
EM2215769

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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - SW
Contact Person: Matt Bald	
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
(1)	FS01	2P	12/08/2022	Water	x															FWD to ALS

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ALS	**Lab Use Only**	
Print Name: Matt Bald	Print Name: KSF	Job number:	Cooling: Ice / Ice pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 17/8/22 16:35	Temperature:	Security seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	

Relinquished ELS Melb AP 17/8/22
received 16/8/22.

CHAIN OF CUSTODY FORM - Client

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Environmental Division
Melbourne
Work Order Reference
EM2215769

Telephone : + 61-3-8549 9600

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National phone number

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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - SW
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No. :
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
(1)	FS01	2P	12/08/2022	Water	x															FWD to ALS

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

		Lab Use Only	
Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ALS	Job number:	Cooling: Ice / Ice pack / None
Print Name: Matt Bald	Print Name: RSF	Temperature:	Security seal: Intact / Broken / None
Date & Time: 15/08/2022; 1530	Date & Time: 17/8/22 16:35	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	
Signature: MB	Signature:		

Relinquished ELS Melb AP 17/8/22
received 16/8/22.

CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
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Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title):
Contact Person: Matt Bald	12583428 - MFS Adelaide DSI - SW
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald, Ally Kirkman	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com dilara.valiff@ghd.com matt.bald@ghd.com ally.kirkman@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	SW01	2P	12/08/2022	Water	x															
2	SW03	2P	12/08/2022	Water	x															
3	SW05	2P	12/08/2022	Water	x															
4	SW06	2P	12/08/2022	Water	x															
5	SW11	2P	12/08/2022	Water	x															
6	SW14	2P	12/08/2022	Water	x															
7	SW16	2P	12/08/2022	Water	x															
8	FD01	2P	12/08/2022	Water	x															
9	RB04	2P	12/08/2022	Water	x															

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ECS Melb	*Lab Use Only*
Print Name: Matt Bald	Print Name: L Olsen	Job number: 33107 / Cooling: Ice / Ice pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 17/8/22 8.10am	Temperature: 7-10C / Security Seal: Intact / Broken / None
Signature: MB	Signature:	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

COC received 1-17pm 17/8/22

CHAIN OF CUSTODY FORM - Client

ENVIROLAB GROUP
National phone number 1300 424 344

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12 Ashley St, Chatswood, NSW 2067
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Melbourne Lab - Envirolab Services
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① 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - SW
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No.:
Sampler: Matt Bald, Ally Kirkman	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com, ally.kirkman@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	SW01	2P	12/08/2022	Water						x										
2	SW03	2P	12/08/2022	Water						x										
3	SW05	2P	12/08/2022	Water						x										
4	SW06	2P	12/08/2022	Water						x										
5	SW11	2P	12/08/2022	Water						x										
6	SW14	2P	12/08/2022	Water						x										
7	SW16	2P	12/08/2022	Water						x										
8	FD01	2P	12/08/2022	Water						x										
9	RB04	2P	12/08/2022	Water						x										

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS Melb	*Lab Use Only*
Print Name: Matt Bald	Print Name: AP	Job number: 33107 — Cooling: Ice / Ice pack / None
Date & Time: 15/08/2022; 1530	Date & Time: 16/8/22 8:10am	Temperature: 7.1 — Security seal: Intact / Broken / None
Signature: MB	Signature: AP	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

COC Received 3:13pm 16/8/22

Envirolab Services Pty Ltd
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25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33107

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428 - MFS Adelaide DSI - SW**
Number of Samples	9 Water
Date samples received	16/08/2022
Date completed instructions received	17/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	23/08/2022
Date of Issue	19/08/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Water Short						
Our Reference		33107-1	33107-2	33107-3	33107-4	33107-5
Your Reference	UNITS	SW01	SW03	SW05	SW06	SW11
Date Sampled		12/08/2022	12/08/2022	12/08/2022	12/08/2022	12/08/2022
Type of sample		Water	Water	Water	Water	Water
Date prepared	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Date analysed	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	0.20	0.09	0.09	0.35	0.24
Perfluorooctanesulfonic acid PFOS	µg/L	5.0	1.8	0.31	1.7	1.4
Perfluorooctanoic acid PFOA	µg/L	0.04	0.01	<0.01	0.05	0.03
6:2 FTS	µg/L	0.12	0.05	<0.01	0.14	0.09
8:2 FTS	µg/L	0.1	0.04	<0.02	0.06	0.04
Surrogate $^{13}C_8$ PFOS	%	106	104	106	107	105
Surrogate $^{13}C_2$ PFOA	%	105	103	102	104	106
Extracted ISTD $^{18}O_2$ *PFHxS*	%	89	87	89	92	87
Extracted ISTD $^{13}C_4$ *PFOS*	%	83	91	91	90	90
Extracted ISTD $^{13}C_4$ *PFOA*	%	93	93	93	97	95
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	100	95	95	97	97
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	97	95	101	97	98
Total Positive PFHxS & PFOS	µg/L	5.2	1.9	0.40	2.1	1.6
Total Positive PFOS & PFOA	µg/L	5.0	1.8	0.31	1.7	1.4
Total Positive PFAS	µg/L	5.4	2.0	0.40	2.3	1.8

PFAS in Water Short					
Our Reference		33107-6	33107-7	33107-8	33107-9
Your Reference	UNITS	SW14	SW16	FD01	RB04
Date Sampled		12/08/2022	12/08/2022	12/08/2022	12/08/2022
Type of sample		Water	Water	Water	Water
Date prepared	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Date analysed	-	18/08/2022	18/08/2022	18/08/2022	18/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/L	0.13	1.3	0.18	<0.01
Perfluorooctanesulfonic acid PFOS	µg/L	0.53	0.15	4.7	<0.01
Perfluorooctanoic acid PFOA	µg/L	0.01	0.11	0.04	<0.01
6:2 FTS	µg/L	<0.01	<0.01	0.13	<0.01
8:2 FTS	µg/L	<0.02	<0.02	0.08	<0.02
Surrogate $^{13}C_8$ PFOS	%	101	103	109	102
Surrogate $^{13}C_2$ PFOA	%	108	107	103	106
Extracted ISTD $^{18}O_2$ *PFHxS*	%	89	88	94	92
Extracted ISTD $^{13}C_4$ *PFOS*	%	91	90	87	92
Extracted ISTD $^{13}C_4$ *PFOA*	%	94	93	95	95
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	94	93	93	93
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	99	96	109	96
Total Positive PFHxS & PFOS	µg/L	0.66	1.5	4.9	<0.01
Total Positive PFOS & PFOA	µg/L	0.54	0.26	4.7	<0.01
Total Positive PFAS	µg/L	0.67	1.6	5.1	<0.01

Method ID	Methodology Summary
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Water Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33107-3
Perfluorohexanesulfonic acid PFHxS	µg/L	0.01	Org-029	<0.01	2	0.09	0.09	0	107	119
Perfluorooctanesulfonic acid PFOS	µg/L	0.01	Org-029	<0.01	2	1.8	1.8	0	114	118
Perfluorooctanoic acid PFOA	µg/L	0.01	Org-029	<0.01	2	0.01	0.01	0	111	117
6:2 FTS	µg/L	0.01	Org-029	<0.01	2	0.05	0.05	0	106	114
8:2 FTS	µg/L	0.02	Org-029	<0.02	2	0.04	0.03	29	116	118
Surrogate $^{13}C_8$ PFOS	%		Org-029	109	2	104	109	5	113	105
Surrogate $^{13}C_2$ PFOA	%		Org-029	102	2	103	112	8	102	104
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	89	2	87	89	2	90	87
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	91	2	91	87	4	85	87
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	96	2	93	91	2	90	89
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	92	2	95	93	2	93	95
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	95	2	95	99	4	89	94

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
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SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Dilara Valiff

Sample Login Details

Your reference	12583428 - MFS Adelaide DSI - SW
Envirolab Reference	33107
Date Sample Received	16/08/2022
Date Instructions Received	17/08/2022
Date Results Expected to be Reported	23/08/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	9 Water
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.1
Cooling Method	Icepack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
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melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Water Short
SW01	✓
SW03	✓
SW05	✓
SW06	✓
SW11	✓
SW14	✓
SW16	✓
FD01	✓
RB04	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

CHAIN OF CUSTODY FORM - Client

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ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
✆ 02 9910 6200 | ✉ sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6800 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
✆ 07 3266 9532 | ✉ brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Waste Disposal
Contact Person: Matt Bald	PO No.:
Project Mgr: Dilara Valiff	Envirolab Quote No.:
Sampler: Matt Bald	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com, dilara.valiff@ghd.com, matt.bald@ghd.com	Lab Comments:

Sample Information					Tests Required															Comments
Envirolab Sample ID	Client Sample ID or Information	Container Type	Date sampled	Type of sample	PFAS (Short)					HOLD										Provide as much information about the sample as you can
1	MW01_COMP	2P	12/08/2022	Soil	x															Composite sample

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

		Lab Use Only	
Relinquished by (Company): Matt Bald (GHD)	Received by (Company): ELS	Job number: 33106	Cooling: Ice / Ice pack / None
Print Name: Matt Bald	Print Name: S. Stopic	Temperature: 7.1°C	Security seal: Intact / Broken / None
Date & Time: 15/08/2022; 1530	Date & Time: 16/8/22 8.10am.	TAT Req - SAME day / 1 / 2 / 3 / 4 / STD	
Signature: MB	Signature:		

COC received 3:13 pm 16/8/22

Envirolab Services Pty Ltd
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melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33106

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428- Waste Disposal**
Number of Samples	1 Soil
Date samples received	16/08/2022
Date completed instructions received	16/08/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	23/08/2022
Date of Issue	23/08/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Chris De Luca, Operations Manager
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short		
Our Reference		33106-1
Your Reference	UNITS	MW01_COMP
Date Sampled		12/08/2022
Type of sample		Soil
Date prepared	-	19/08/2022
Date analysed	-	19/08/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.5
Perfluorooctanesulfonic acid PFOS	µg/kg	2.5
Perfluorooctanoic acid PFOA	µg/kg	<0.1
6:2 FTS	µg/kg	<0.1
8:2 FTS	µg/kg	<0.2
Surrogate $^{13}C_8$ PFOS	%	105
Surrogate $^{13}C_2$ PFOA	%	102
Extracted ISTD $^{18}O_2$ *PFHxS*	%	92
Extracted ISTD $^{13}C_4$ *PFOS*	%	91
Extracted ISTD $^{13}C_4$ *PFOA*	%	93
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	83
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	83
Total Positive PFHxS & PFOS	µg/kg	3.0
Total Positive PFOS & PFOA	µg/kg	2.5
Total Positive PFAS	µg/kg	3.0

Moisture		
Our Reference		33106-1
Your Reference	UNITS	MW01_COMP
Date Sampled		12/08/2022
Type of sample		Soil
Date prepared	-	18/08/2022
Date analysed	-	19/08/2022
Moisture	%	34

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short					Duplicate				Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	[NT]
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	100	[NT]
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	105	[NT]
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	102	[NT]
6:2 FTS	µg/kg	0.1	Org-029	<0.1	[NT]	[NT]	[NT]	[NT]	101	[NT]
8:2 FTS	µg/kg	0.2	Org-029	<0.2	[NT]	[NT]	[NT]	[NT]	114	[NT]
Surrogate $^{13}C_8$ PFOS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	101	[NT]
Surrogate $^{13}C_2$ PFOA	%		Org-029	105	[NT]	[NT]	[NT]	[NT]	103	[NT]
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	105	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	104	[NT]	[NT]	[NT]	[NT]	94	[NT]
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	110	[NT]	[NT]	[NT]	[NT]	98	[NT]
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	99	[NT]	[NT]	[NT]	[NT]	93	[NT]
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	102	[NT]	[NT]	[NT]	[NT]	85	[NT]

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

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In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

Envirolab Services Pty Ltd
ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Dilara Valiff

Sample Login Details

Your reference	12583428- Waste Disposal
Envirolab Reference	33106
Date Sample Received	16/08/2022
Date Instructions Received	16/08/2022
Date Results Expected to be Reported	23/08/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	1 Soil
Turnaround Time Requested	Standard
Temperature on Receipt (°C)	7.1
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

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ABN 37 112 535 645 - 002
25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Soil Short
MW01_COMP	✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.
Requests for longer term sample storage must be received in writing.
Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

CHAIN OF CUSTODY FORM - Client

[Copyright and Confidential]

ENVIROLAB GROUP
National phone number 1300 424 344

Sydney Lab - Envirolab Services
12 Ashley St, Chatswood, NSW 2067
✆ 02 9910 6200 | ✉ sydney@envirolab.com.au

Perth Lab - MPL Laboratories
16-18 Hayden Crt, Myaree, WA 6154
✆ 08 9317 2505 | ✉ lab@mpl.com.au

Melbourne Lab - Envirolab Services
25 Research Drive, Croydon South, VIC 3136
✆ 03 9763 2500 | ✉ melbourne@envirolab.com.au

Adelaide Office - Envirolab Services
7a The Parade, Norwood, SA 5067
✆ 08 7087 6800 | ✉ adelaide@envirolab.com.au

Brisbane Office - Envirolab Services
20a, 10-20 Depot St, Banyo, QLD 4014
✆ 07 3266 9532 | ✉ brisbane@envirolab.com.au

Darwin Office - Envirolab Services
Unit 20/119 Reichardt Road, Winnellie, NT 0820
✆ 08 8967 1201 | ✉ darwin@envirolab.com.au

Client: GHD Pty Ltd	Client Project Name/Number/Site etc (ie report title): 12583428 - MFS Adelaide DSI - Waste Disposal
Contact Person: Matt Bald	
Project Mgr: Dilara Valiff	PO No.:
Sampler: Matt Bald	Envirolab Quote No. :
Address: Level 4, 211 Victoria Square, Adelaide SA 5000	Date results required: Or choose: standard *Note: Inform lab in advance if urgent turnaround is required - surcharges apply*
Phone: (08) 8111 6712 Mob: 0423 876 470	Additional report format: esdat
Email: GHDLabReports@ghd.com ben.petticrew@ghd.com matt.bald@ghd.com steven.castillo@ghd.com	Lab Comments: * Homogenise samples before analysis LCS ECS 30/9/22

Sample Information					Tests Required														Comments
Envirolab Sample ID	Client Sample ID or information	Container Type	Date sampled	Type of sample	PFAS (Short)	SA EPA Waste Screen				HOLD									Provide as much information about the sample as you can
1	MW02_COMP	1J, 1P	9/29/2022	Soil	x														Composite sample
2	MW03_COMP	1J, 1P	9/29/2022	Soil	x														Composite sample
3	MW05_COMP	1J, 1P	9/29/2022	Soil	x														Composite sample
4	MW06_COMP	1J, 1P	9/29/2022	Soil	x														Composite sample
5	MW07_COMP	1J, 1P	9/29/2022	Soil	x														Composite sample
6	FD01_COMP	1J, 1P	9/29/2022	Soil						x									Composite sample
7	FS01_COMP	1J, 1P	9/29/2022	Soil						x									Composite sample

Please tick the box if observed settled sediment present in water samples is to be included in the extraction and/or analysis

Relinquished by (Company): Steven Castillo (GHD)	Received by (Company): ECS Adelaide / ELS Melb		Lab Use Only
Print Name: Steven Castillo	Print Name: Alex Stanto	AP	Job number: 33830 — Cooling: Ice / Ice pack / None
Date & Time:30/09/2022	Date & Time: 30/9/22 @ 1pm	3/10/22 7am	Temperature: 12.8 — Security seal: Intact / Broken / None
Signature:	Signature: 9.8°C ice		TAT Req - SAME day / 1 / 2 / 3 / 4 / STD

Sample Receipt Melbourne

From: Steven Castillo <Steven.Castillo@ghd.com>
Sent: Friday, 30 September 2022 5:09 PM
To: Alex Stenta
Cc: Adelaide
Subject: RE: Job Number 12583428 - Waters

Also with regards to turnaround time – water samples are just **standard TAT** whereas with soil samples could we please do **3-day TAT**?

Apologies for the chain of follow-up requests!

Regards,

Steven Castillo (he/him)
BSc (Hons) Environmental Science
Graduate Environmental Scientist

GHD
Proudly employee-owned | ghd.com
Level 4 211 Victoria Square Adelaide SA 5000 Australia
D +61 8 8111 6832 M +61 408 004 659 E steven.castillo@ghd.com

---

From: Alex Stenta <astenta@envirolab.com.au>
Sent: Friday, September 30, 2022 4:09 PM
To: Steven Castillo <Steven.Castillo@ghd.com>
Cc: Adelaide <adelaide@envirolab.com.au>
Subject: RE: Job Number 12583428 - Waters

Hi Steven,

No problem at all.

Kind Regards,

Alex Stenta | BD Manager SA | Envirolab Services

Great Science. Great Service.

7a The Parade Norwood SA 5067
T 08 7087 6800 | M 0406 350 706
E astenta@envirolab.com.au | W www.envirolab.com.au

Follow us on: LinkedIn | Facebook | Twitter

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melbourne@envirolab.com.au
www.envirolab.com.au

CERTIFICATE OF ANALYSIS 33830

Client Details

Client	GHD SA
Attention	Dilara Valiff
Address	Level 4, 211 Victoria Square, Adelaide, SA, 5000

Sample Details

Your Reference	**12583428 - MFS Adelaide DSI-Waste Disposal**
Number of Samples	7 Soil
Date samples received	03/10/2022
Date completed instructions received	03/10/2022

Analysis Details

Please refer to the following pages for results, methodology summary and quality control data.

Samples were analysed as received from the client. Results relate specifically to the samples as received.

Results are reported on a dry weight basis for solids and on an as received basis for other matrices.

Report Details

Date results requested by	06/10/2022
Date of Issue	04/10/2022

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Accredited for compliance with ISO/IEC 17025 - Testing. **Tests not covered by NATA are denoted with ***

Results Approved By
Ken Nguyen, Senior Customer Service
Phalak Inthakesone, Group Organics Manager

Authorised By

Pamela Adams, Laboratory Manager

PFAS in Soil Short						
Our Reference		33830-1	33830-2	33830-3	33830-4	33830-5
Your Reference	UNITS	MW02_COMP	MW03_COMP	MW05_COMP	MW06_COMP	MW07_COMP
Date Sampled		29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Date analysed	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanesulfonic acid PFOS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluorooctanoic acid PFOA	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
6:2 FTS	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
8:2 FTS	µg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Surrogate $^{13}C_8$ PFOS	%	90	93	93	94	91
Surrogate $^{13}C_2$ PFOA	%	100	101	101	100	102
Extracted ISTD $^{18}O_2$ *PFHxS*	%	77	79	82	86	82
Extracted ISTD $^{13}C_4$ *PFOS*	%	80	82	87	88	86
Extracted ISTD $^{13}C_4$ *PFOA*	%	82	84	88	89	84
Extracted ISTD $^{13}C_2$ *6:2FTS*	%	75	78	80	79	79
Extracted ISTD $^{13}C_2$ *8:2FTS*	%	78	80	87	84	79
Total Positive PFHxS & PFOS	µg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Total Positive PFOS & PFOA	µg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total Positive PFAS	µg/kg	0.1	<0.1	<0.1	<0.1	<0.1

Moisture						
Our Reference		33830-1	33830-2	33830-3	33830-4	33830-5
Your Reference	UNITS	MW02_COMP	MW03_COMP	MW05_COMP	MW06_COMP	MW07_COMP
Date Sampled		29/09/2022	29/09/2022	29/09/2022	29/09/2022	29/09/2022
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	03/10/2022	03/10/2022	03/10/2022	03/10/2022	03/10/2022
Date analysed	-	04/10/2022	04/10/2022	04/10/2022	04/10/2022	04/10/2022
Moisture	%	30	30	35	33	29

Method ID	Methodology Summary
Inorg-008	Moisture content determined by heating at 105°C for a minimum of 12 hours.
Org-029	Soil samples are extracted with basified Methanol. Waters and soil extracts are directly injected and/or concentrated/extracted using SPE. TCLP/ASLP leachates are centrifuged, the supernatant is then analysed (including amendment with solvent) - as per the option in AS4439.3. Analysis is undertaken with LC-MS/MS. PFAS results include the sum of branched and linear isomers where applicable. Please note that PFAS results are corrected for Extracted Internal Standards (QSM 5.3 Table B-15 terminology), which are mass labelled analytes added prior to sample preparation to assess matrix effects and verify processing of the sample. PFAS analytes without a commercially available mass labelled analogue are corrected vs a closely eluting mass labelled PFAS compound. Surrogates are also reported, in this context they are mass labelled PFAS compounds added prior to extraction but are used as monitoring compounds only (not used for result correction). Envicarb (or similar) is used discretionally to remove interfering matrix components. Please contact the laboratory if estimates of Measurement Uncertainty are required as per WA DER

QUALITY CONTROL: PFAS in Soil Short						Duplicate			Spike Recovery %	
Test Description	Units	PQL	Method	Blank	#	Base	Dup.	RPD	LCS-1	33830-2
Perfluorohexanesulfonic acid PFHxS	µg/kg	0.1	Org-029	<0.1	1	0.1	0.4	120	115	118
Perfluorooctanesulfonic acid PFOS	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	98	107
Perfluorooctanoic acid PFOA	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	114	114
6:2 FTS	µg/kg	0.1	Org-029	<0.1	1	<0.1	<0.1	0	113	122
8:2 FTS	µg/kg	0.2	Org-029	<0.2	1	<0.2	<0.2	0	114	119
Surrogate $^{13}C_8$ PFOS	%		Org-029	89	1	90	93	3	87	89
Surrogate $^{13}C_2$ PFOA	%		Org-029	104	1	100	100	0	101	100
Extracted ISTD $^{18}O_2$ PFHxS	%		Org-029	92	1	77	78	1	86	83
Extracted ISTD $^{13}C_4$ PFOS	%		Org-029	93	1	80	77	4	92	84
Extracted ISTD $^{13}C_4$ PFOA	%		Org-029	97	1	82	80	2	88	85
Extracted ISTD $^{13}C_2$ 6:2FTS	%		Org-029	85	1	75	71	5	84	80
Extracted ISTD $^{13}C_2$ 8:2FTS	%		Org-029	98	1	78	76	3	88	80

Result Definitions

NT	Not tested
NA	Test not required
INS	Insufficient sample for this test
PQL	Practical Quantitation Limit
<	Less than
>	Greater than
RPD	Relative Percent Difference
LCS	Laboratory Control Sample
NS	Not specified
NEPM	National Environmental Protection Measure
NR	Not Reported

Quality Control Definitions

Blank	This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.
Duplicate	This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.
Matrix Spike	A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.
LCS (Laboratory Control Sample)	This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.
Surrogate Spike	Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Australian Drinking Water Guidelines recommend that Thermotolerant Coliform, Faecal Enterococci, & E.Coli levels are less than 1cfu/100mL. The recommended maximums are taken from "Australian Drinking Water Guidelines", published by NHMRC & ARMC 2011.

The recommended maximums for analytes in urine are taken from “2018 TLVs and BEIs”, as published by ACGIH (where available). Limit provided for Nickel is a precautionary guideline as per Position Paper prepared by AIOH Exposure Standards Committee, 2016.

Guideline limits for Rinse Water Quality reported as per analytical requirements and specifications of AS 4187, Amdt 2 2019, Table 7.2

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.

Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.

Spikes for Physical and Aggregate Tests are not applicable.

For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: >10xPQL - RPD acceptance criteria will vary depending on the analytes and the analytical techniques but is typically in the range 20%-50% – see ELN-P05 QA/QC tables for details; <10xPQL - RPD are higher as the results approach PQL and the estimated measurement uncertainty will statistically increase.

Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals (not SPOCAS); 60-140% for organics/SPOCAS (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Where matrix spike recoveries fall below the lower limit of the acceptance criteria (e.g. for non-labile or standard Organics <60%), positive result(s) in the parent sample will subsequently have a higher than typical estimated uncertainty (MU estimates supplied on request) and in these circumstances the sample result is likely biased significantly low.

Measurement Uncertainty estimates are available for most tests upon request.

Analysis of aqueous samples typically involves the extraction/digestion and/or analysis of the liquid phase only (i.e. NOT any settled sediment phase but inclusive of suspended particles if present), unless stipulated on the Envirolab COC and/or by correspondence. Notable exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, total recoverable metals and PFAS where solids are included by default.

Samples for Microbiological analysis (not Amoeba forms) received outside of the 2-8°C temperature range do not meet the ideal cooling conditions as stated in AS2031-2012.

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ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

SAMPLE RECEIPT ADVICE

Client Details

Client	GHD SA
Attention	Dilara Valiff

Sample Login Details

Your reference	12583428 - MFS Adelaide DSI-Waste Disposal
Envirolab Reference	33830
Date Sample Received	03/10/2022
Date Instructions Received	03/10/2022
Date Results Expected to be Reported	06/10/2022

Sample Condition

Samples received in appropriate condition for analysis	Yes
No. of Samples Provided	7 Soil
Turnaround Time Requested	72hr
Temperature on Receipt (°C)	12.8
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments

Nil

Please direct any queries to:

Pamela Adams	Chris De Luca
Phone: 03 9763 2500	**Phone: 03 9763 2500**
Fax: 03 9763 2633	**Fax: 03 9763 2633**
Email: padams@envirolab.com.au	**Email: cdeluca@envirolab.com.au**

Analysis Underway, details on the following page:

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25 Research Drive Croydon South VIC 3136
ph 03 9763 2500 fax 03 9763 2633
melbourne@envirolab.com.au
www.envirolab.com.au

Sample ID	PFAS in Soil Short	On Hold
MW02_COMP	✓	
MW03_COMP	✓	
MW05_COMP	✓	
MW06_COMP	✓	
MW07_COMP	✓	
FD01_COMP		✓
FS01_COMP		✓

The '✓' indicates the testing you have requested. **THIS IS NOT A REPORT OF THE RESULTS.**

Additional Info

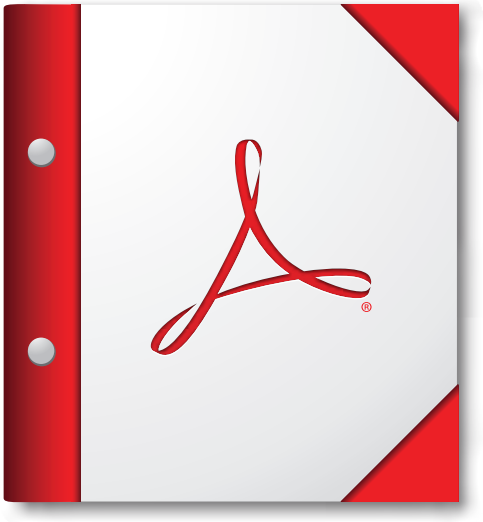
Sample storage - Waters are routinely disposed of approximately 1 month and soils approximately 2 months from receipt.

Requests for longer term sample storage must be received in writing.

Please contact the laboratory immediately if observed settled sediment present in water samples is to be included in the extraction and/or analysis (exceptions include certain Physical Tests (pH/EC/BOD/COD/Apparent Colour etc.), Solids testing, Total Recoverable metals and PFAS analysis where solids are included by default.

Appendix H

Section 83A Notification



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Site contamination – Section 83A notification form

Site contamination that affects or threatens underground water notification form pursuant to section 83A of the *Environment Protection Act 1993*

Notifier details

Name: A shift Officers	Telephone: (08) 8111 6527
Company: GHD Pty Ltd.	Email:
Address: Level 4, 211 Victoria Square ADELAIDE SA 5000	○ the site owner ○ the site occupier ◉ the site contamination consultant ○ the site contamination auditor

Site details

Site or establishment name (if appropriate): South Australian Metropolitan Fire Service - Adelaide Fire Station

Owner(s) (please include contact details where known): South Australian Metropolitan Fire Service	Occupier(s) (where different to owner): N/A
Street address(es) (include lot or street number): Wakefield Street, ADELAIDE SA 5000	Certificate(s) of title (current): CT6181/979, CT5943/887, CT5782/242, CT5943/888

Location, nature and extent

Has a potentially contaminating activity been undertaken at the site, please describe: Historical use of AFFF

Does this notification relate to a change in the location, nature or extent of site contamination that has previously been notified to the EPA? ◉ Yes ○ No

If yes, please provide the date(s) of previous notification(s): 30/07/2021

Which group(s) do the chemical substance(s), identified as site contamination that affects or threatens groundwater, belong to?

☐ Metals & metalloids	☐ Non-metallic inorganics	☐ Organic alcohols/other organics
☐ Petroleum hydrocarbons	☐ Anilines	☐ Chlorinated alkanes
☐ Chlorinated alkenes	☐ Chlorinated benzenes	☐ Polychlorinated biphenyls
☐ Other chlorinated compounds	☐ Monocyclic aromatic compounds	☐ Polycyclic aromatic compounds
☐ Phenols	☐ Phthalates	☐ Pesticides/herbicides/fungicides
☐ Surfactants	☑ Other (please specify): PFAS(Per-and poly-fluoroalkyl substances	

Has an assessment of the environmental values of groundwater been undertaken? (●) Yes ( ) No

If yes, what is the TDS range in mg/L (lowest concentration for the site)? 4,500 – 8,760 mg/L

What are the environmental values of groundwater for the site?

- [ ] Drinking water
- [ ] Primary industries (irrigation and general water uses)
- [ ] Recreation and aesthetics
- [ ] Aquatic ecosystems (marine)
- [x] Aquatic ecosystems (fresh)
- [ ] Primary industries (aquaculture)
- [ ] Primary industries (agriculture)

Where has the site contamination that affects or threatens groundwater been identified?

- [ ] Soil/soil vapour
- [x] Groundwater

Maximum depth: 17.5 ……m bgl Targeted aquifer(s): Q1 ……

What is the depth to groundwater (where known)? 11.7 to 17.5 ……m bgl

Has a non-aqueous phase liquid been identified or inferred? ( ) Yes (●) No

If yes, please provide details of measured thickness (in metres):……

Has site contamination that affects or threatens groundwater been identified[1] offsite? (●) Yes ( ) No

If yes, please specify offsite certificate(s) of title or address(es): MW03 102 Roper St & MW05 21 Chancery Ln, 30

An accurate scaled site plan showing sampling locations has been included. [x]

This notification provides the following information to determine the existence of site contamination and the support notification of site contamination that affects or threatens groundwater at the site?

Monitoring well data[2]	(●) Yes ( ) No	Soil lithological data	( ) Yes (●) No
Groundwater field data	(●) Yes ( ) No	Soil vapour bore data	( ) Yes (●) No
Analytical laboratory data	(●) Yes ( ) No		
Quality assurance data	(●) Yes ( ) No		

Has the electronic data been assessed as reliable in meeting the objectives of the assessment? (●) Yes ( ) No

[1] Using direct evidence and not inferred information

[2] Not required where electronic information has previously been provided to the EPA and the data has not changed

Further assessment details	
Have chemical substances been identified that may represent background concentrations? ○ Yes ◉ No	
If yes, will a background concentration[3] assessment be undertaken within the next 3 months? ○ Yes ◉ No	
Is any further assessment being undertaken? ☐ Preliminary site investigation ☐ Detailed site investigation ☑ Groundwater monitoring event ☑ Other: Surface water/ecological sampling	Is the site subject to a current site contamination audit? ○ Yes ◉ No If yes, please specify the EPA reference number for the audit: ……..
Declaration	
It is an offence to provide false or misleading information to the Authority. Maximum penalties range from $30,000 for a natural person, to $60,000 for a body corporate, pursuant to section 119 of the Environment Protection Act 1993.	
I/We declare that the information provided in this form and any accompanying documents is not false or misleading in any material particular:	
Name: Dilara Valiff	Name:
Position: Firefighters and Officers	Position:
Signature:	Signature:
Date:	Date:

[3] Carried out in accordance with the *EPA Guideline for the assessment of background concentrations (2018)*

Appendix I

QA/QC Report

Appendix I Quality Assurance and Quality Control Report

1. Laboratories and data set

The soil, groundwater, sediment and surface water samples collected during the investigation were submitted to Envirolab as the primary laboratory and ALS as the secondary laboratory. These laboratories are NATA accredited to perform the required analysis, with the exception of metals in vegetation samples, which are only accredited by the internal laboratory testing accreditation.

The selected laboratories conducted the requested analyses in accordance with the guidelines outlined in ASC NEPM.

The primary results and QA/QC results were reported in the laboratory Certificates of Analysis provided in Appendix H.

2. Data quality indicators

Table 1 provides a review of the DQIs adopted during the sampling investigation.

Table 1 DQI review

DQI	Objective	Outcome	References
GHD Internal Procedures			
Comparison of field and analytical data	Agreement between visual and olfactory evidence with laboratory results	Achieved	This was reflected in analytical results. ALS/Eurofins Certificates of Analysis (Appendix E) and Field Records (Appendix F)
Calibration of field instruments	Meet calibration specifications	Achieved	Calibration certificates can be found in Appendix J
Chain of Custody documentation	Supply Chain of Custody Documentation with all samples	Achieved	Copies of Chain of Custody Documentation (Appendix H)
Sample analysis and extraction holding times	Comply with holding times	Achieved	ALS/Eurofins Laboratory Quality Control Reports (Appendix H)
Analysis of inter and intra-laboratory duplicate samples	Analysis of duplicate samples in 10% of primary samples	Achieved	AS4482.1-2005 and US EPA NEPM 1999 (as amended 2013) and ALS/Eurofins certificates of analysis (Appendix H)
External Laboratory Procedures			
Analysis of laboratory method blanks	No contamination of blanks	Achieved	ALS/Eurofins Laboratory Quality Control Reports (Appendix H)
Analysis of laboratory spike recoveries	Recoveries within the laboratory specified recovery limits	Achieved	ALS/Eurofins Laboratory Quality Control Reports (Appendix H)

DQI	Objective	Outcome	References
Analysis of laboratory internal duplicates	Frequencies and RPDs within guideline and internal laboratory limits (RPD of 0-30%)	Achieved	NEPM 1999 (as amended 2013). ALS/Eurofins Laboratory Quality Control Reports (Appendix H)

3. QA/QC assessment method

Established QA/QC procedures to assess data quality were maintained throughout the project. The QA/QC program undertaken as part of the assessment by GHD included the following:

– Use of appropriately qualified and trained staff.
– Use of PFAS-free sampling equipment and laboratory sample containers.
– Preservation of samples with ice during transport from the field to the laboratory.
– Transportation of samples with accompanying chain-of-custody documentation.
– Compliance with sample holding times.
– Review of results of a blind duplicate samples.
– Review of results of a split duplicate samples.
– Review of results of a field blank samples.
– Review of internal analysis of laboratory duplicates, spikes and blanks.

The QC program employed during this investigation was in accordance with the general requirements set out in the Australian Standard AS4482.1 (2005) and the NEMP 2.0 (2020). QC samples provide information that discounts or potentially identifies errors due to possible sources of cross contamination, inconsistencies in sampling and analytical techniques used. The QC program completed included the collection and analysis of duplicate samples, rinsate samples and trip blank samples as described below:

– **Blind duplicate samples:** These are coded duplicate samples submitted to the primary laboratory for analysis as individual samples without any indication to the laboratory that they have been duplicated.
– **Split duplicate samples:** These are duplicate samples split in the field, with one sample being sent to a secondary laboratory for analysis. The same parameters are analysed utilising similar analytical techniques.
– **Rinsate samples:** A rinsate sample is collected from a re-usable piece of equipment to detect potential cross-contamination between sampling locations.
– **Trip Blanks:** A laboratory supplied uncontaminated (blank) deionised water sample which is placed within the ice chest with the samples. This sample is analysed at the laboratory to indicate if contamination occurred during transportation of samples.

A quantitative measure of the accuracy of the check analyses results obtained was made using calculated relative percentage difference (RPD) values. The RPD values were calculated using the following equation.

$$RPD(\%) = \frac{\langle Co - Cs \rangle}{\left\langle \frac{Co + Cs}{2} \right\rangle} \times 100$$

Where Co = concentration obtained from the original sample

Cs = concentration obtained from the duplicate sample

4. GHD field quality control

4.1 Duplicate samples

All RPD values were within the acceptable ranges with exceptions summarised in Table 2. All RPD results can be found in full at the end of this report.

Table 2 Blind duplicate and split duplicate RPD exceedance summary

Primary Sample	QAQC Samples	Analyte	Primary result (mg/kg)	Duplicate Result (mg/kg)	Split Result (mg/kg)	Highest RPD (%)
Sediment						
SED-05	FD02 FS02	Moisture (%)	39	56	36	32
		(PFHxS	0.0023	0.0032	0.0011	71
		PFOS	0.034	0.05	0.0177	63
		Sum of PFHxS and PFOS	0.037	0.053	0.0188	85
		Sum of US EPA PFAS (PFOS + PFOA)*	0.034	0.053	-	38
		PFAS (Sum of Total)	0.037	0.053	0.037	37
Soil						
BH07	FD01 FS01	6:2 FTS	0.061	0.069	0.0842	32
		8:2 FTS	<0.0002	0.0003	<0.0005	40
BH08	FD02 FS02	PFHxS	0.0049	0.0027	0.0019	88
		PFOS	0.2	0.13	0.132	42
		PFOA	0.0005	0.0003	<0.0002	86
		6:2 FTS	0.0007	0.0002	<0.0005	111
		Sum of PFHxS and PFOS	0.2	0.14	0.134	40
		Sum of US EPA PFAS (PFOS + PFOA)*	0.2	0.13	-	42
		PFAS (Sum of Total)	0.21	0.14	-	40
BH14	FD03 FS03	PFHxS	0.0055	0.0046	0.0040	32
		8:2 FTS	0.0003	0.0002	<0.0005	40
BH16	FD04 FS03	PFHxS	0.0087	0.0022	0.0024	119
		PFOS	0.13	0.035	0.0353	115

Primary Sample	QAQC Samples	Analyte	Primary result (mg/kg)	Duplicate Result (mg/kg)	Split Result (mg/kg)	Highest RPD (%)
		PFOA	0.0006	0.0002	0.0002	100
		6:2 FTS	0.0003	<0.0001	<0.0005	100
		Sum of PFHxS and PFOS	0.14	0.037	0.0377	116
		Sum of US EPA PFAS (PFOS + PFOA)*	0.13	0.035	-	115
		PFAS (Sum of Total)	0.14	0.038	-	115
Surface water						
SW01	FD01 FS01	PFHxS	0.20	0.18	0.14	35
		PFOS	5.0	4.7	3.59	33
		8:2 Fluorotelomer sulfonic acid (8:2 FTS)	0.1	0.08	0.07	35
		Sum of PFHxS and PFOS	5.2	4.9	3.73	33
Ground water						
GW01	FS01 FD01	PFBA	0.99	0.97	0.3	107
		PFOA	1.5	1.5	1.08	33

Soil and sediment RPD exceedances are likely due to the heterogeneity of soil and sediment samples, and given all other RPD values are within the acceptable range, GHD considers the data set to be an acceptable quality for which to base this assessment. Additionally given the low level concentrations detectable for PFAS compounds the likelihood of elevated RPD values is increased.

Groundwater and surface water RPD exceedances found in PFAS samples are considered minor given they are within the same order of magnitude.

Blind duplicate and split duplicate sample frequency

A summary of the blind and split duplicate sample frequency is presented in Table 3.

Table 3 Blind duplicate and split duplicate sample frequency

Primary Samples Count	Blind Duplicate Samples Count	Percentage of Primary Samples	Required QC sample frequency of 5% met?	Split Samples Count	Percentage of Primary Samples	Required QC sample frequency of 5% met?
85	8	9.41%	Yes	7	8.24%	Yes

The QC rates for the soil, sediment, groundwater, and surface water investigations satisfies the data quality objective for this investigation as they are in general accordance with Australian Standard AS4482.1-2005 and the NEMP 2.0 (2020).

4.2 Trip Blanks

All analytes were reported below the laboratory LOR for the trip blank sample analysed. Trip blank results are presented at the end of this report.

4.3 Rinsate Blanks

All analytes were reported below the laboratory LOR for the rinsate sample analysed. Rinsate blank results are presented at the end of this report.

5. Laboratory QA/QC

Results of the internal laboratory quality control programs are included in the laboratory reports provided in Appendix H.

5.1 Internal duplicates

RPDs for laboratory internal duplicates were within the laboratory nominated accepted ranges.

5.2 Matrix spikes

Matrix spikes were within the laboratory acceptable ranges, with the exception of those presented in Table 4.

Table 4 Matrix spike outliers

Analyte	Laboratory Report	Laboratory Comments
Perfluorooctanesulfonic acid PFOS	33011-A	Matrix spike recovery is not possible to report for 33011-A-13 and 33011-A-22 for PFOS due to the high concentration of analytes in the sample/s have caused interference.
Perfluorooctanesulfonic acid PFOS	33105	Matrix spike recovery is not possible to report for 33105-2 for PFOS due to the high concentration of analytes in the sample/s have caused interference.

5.3 Laboratory control spikes

Laboratory control spikes were within the laboratory nominated acceptable ranges.

5.4 Method blanks

All reported concentrations for laboratory method blanks analysed by both laboratories were less than their respective laboratory reporting limits.

5.5 Holding times

All samples were analysed for all analytes within the required holding times in accordance with the ASC NEPM.

5.6 Laboratory QA/QC summary

Given the relatively low number of laboratory QA/QC result outliers and the presence of matrix interference in the matrix spike outliers, GHD considers the data to be of satisfactory precision on which to base the assessment.

6. Conclusion

Based on the QA/QC program undertaken during the sampling programs, the data obtained during the assessment is considered to be robust and defensible on which to base interpretations and draw conclusions regarding the environmental status of the site.

Field or Interlab Duplicates

Lab Report Number			33011			33011	EM2215395		33011			33011	EM2215395		33011		
Field ID			BH07_0.4-0.5	FD01		BH07_0.4-0.5	FS01		BH08_0.1-0.2	FD02		BH08_0.1-0.2	FS02		BH14_0.1-0.2	FD03	
Location Code			BH07	BH07		BH07	BH07		BH08	BH08		BH08	BH08		BH14	BH14	
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Date			5/08/2022	5/08/2022		5/08/2022	5/08/2022		5/08/2022	5/08/2022		5/08/2022	5/08/2022		5/08/2022	5/08/2022	
Sample Type			Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD
	Unit	EQL															
Inorganics																	
Moisture (%)	%	0.1	10	12	18	10	11.3	12	6.7	7.2	7	6.7	7.0	4	6.0	6.3	5
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	-	-	-	-	0.0020	-	-	-	-	-	<0.0002	-	-	-	-
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0001	0.051	0.047	8	0.051	0.0623	20	0.0049	0.0027	**58**	0.0049	0.0019	**88**	0.0055	0.0046	18
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0001	8.1	8.7	7	8.1	9.50	16	0.2	0.13	**42**	0.2	0.132	**41**	0.24	0.18	29
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	-	-	-	-	<0.002	-	-	-	-	-	<0.001	-	-	-	-
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	-	-	-	-	0.0040	-	-	-	-	-	<0.0002	-	-	-	-
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	-	-	-	-	0.0395	-	-	-	-	-	0.0005	-	-	-	-
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	-	-	-	-	0.0016	-	-	-	-	-	<0.0002	-	-	-	-
Perfluorooctanoic acid (PFOA)	mg/kg	0.0001	0.0053	0.0053	0	0.0053	0.0048	10	0.0005	0.0003	**50**	0.0005	<0.0002	**86**	0.0004	0.0003	29
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	-	-	-	-
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0001	0.061	0.069	12	0.061	0.0842	**32**	0.0007	0.0002	**111**	0.0007	<0.0005	**33**	0.0001	0.0001	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0002	<0.0002	0.0003	**40**	<0.0002	<0.0005	-	0.0023	0.0024	4	0.0023	0.0023	0	0.0003	0.0002	**40**
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	-	-	-	-
PFAS - Sums																	
Sum of PFHxS and PFOS	mg/kg	0.0001	8.1	8.8	8	8.1	9.56	17	0.2	0.14	**35**	0.2	0.134	**40**	0.25	0.19	27
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.0001	8.1	8.7	7	8.1	-	-	0.2	0.13	**42**	0.2	-	-	0.24	0.18	29
PFAS (Sum of Total)	mg/kg	0.0001	8.2	8.8	7	8.2	-	-	0.21	0.14	**40**	0.21	-	-	0.25	0.19	27
PFAS (Sum of Total)(WA DER List)	mg/kg	0.0002	-	-	-	-	9.70	-	-	-	-	-	0.137	-	-	-	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

Field or Interlab Duplicates

		33011	EM2215395		33011	33011-A		33011	EM2216107		33105			33105	EM2215770	
		BH14_0.1-0.2	FS03		BH16_0.1-0.2	FD04		BH16_0.1-0.2	FS04		SED05	FD06		SED05	FS06	
		BH14	BH14		BH16	BH16		BH16	BH16		SED05			SED05		
		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
		5/08/2022	5/08/2022		5/08/2022	5/08/2022		5/08/2022	5/08/2022		12/08/2022	12/08/2022		12/08/2022	12/08/2022	
		Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD
	Unit															
Inorganics																
Moisture (%)	%	6.0	5.6	7	9.4	8.8	7	9.4	9.0	4	39	56	**36**	39	37.2	5
PFAS - Perfluoroalkyl Sulfonic Acids																
Perfluorobutane sulfonic acid (PFBS)	mg/kg	-	<0.0004	-	-	-	-	-	<0.0002	-	-	-	-	-	0.0002	-
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0055	0.0040	**32**	0.0087	0.0022	**119**	0.0087	0.0024	**114**	0.0023	0.0032	**33**	0.0023	0.0011	**71**
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.24	0.212	12	0.13	0.035	**115**	0.13	0.0353	**115**	0.034	0.05	**38**	0.034	0.0177	**63**
PFAS - Perfluoroalkyl Carboxylic Acids																
Perfluorobutanoic acid (PFBA)	mg/kg	-	<0.002	-	-	-	-	-	<0.001	-	-	-	-	-	<0.001	-
Perfluoropentanoic acid (PFPeA)	mg/kg	-	<0.0004	-	-	-	-	-	<0.0002	-	-	-	-	-	<0.0002	-
Perfluorohexanoic acid (PFHxA)	mg/kg	-	0.0010	-	-	-	-	-	0.0003	-	-	-	-	-	0.0004	-
Perfluoroheptanoic acid (PFHpA)	mg/kg	-	<0.0004	-	-	-	-	-	<0.0002	-	-	-	-	-	<0.0002	-
Perfluorooctanoic acid (PFOA)	mg/kg	0.0004	<0.0004	0	0.0006	0.0002	**100**	0.0006	0.0002	**100**	<0.001	<0.002	0	<0.001	<0.0002	0
PFAS - Fluorotelomer Sulfonic Acids																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	-	<0.0005	-	-	-	-	-	<0.0005	-	-	-	-	-	<0.0005	-
6:2 Fluorotelomer Sulfonate (6:2 FTS)	mg/kg	0.0001	<0.0005	0	0.0003	<0.0001	**100**	0.0003	<0.0005	0	<0.001	<0.002	0	<0.001	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0003	<0.0005	0	0.0004	0.0003	29	0.0004	<0.0005	0	<0.002	<0.005	0	<0.002	<0.0005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	-	<0.0005	-	-	-	-	-	0.0034	-	-	-	-	-	0.0006	-
PFAS - Sums																
Sum of PFHxS and PFOS	mg/kg	0.25	0.216	15	0.14	0.037	**116**	0.14	0.0377	**115**	0.037	0.053	**36**	0.037	0.0188	**65**
Sum of US EPA PFAS (PFOS + PFOA)*	mg/kg	0.24	-	-	0.13	0.035	**115**	0.13	-	-	0.034	0.05	**38**	0.034	-	-
PFAS (Sum of Total)	mg/kg	0.25	-	-	0.14	0.038	**115**	0.14	-	-	0.037	0.053	**36**	0.037	-	-
PFAS (Sum of Total)(WA DER List)	mg/kg	-	0.217	-	-	-	-	-	0.0382	-	-	-	-	-	0.0194	-

***RPDs have only been considered where a conce**
****Elevated RPDs are highlighted as per QAQC Pr**
*****Interlab Duplicates are matched on a per comp**

Appendix I
QAQC Report
RPD Results - GW and SW

Field or Interlab Duplicates

Lab Report Number			33107			33107	EM2215769		33831			33831	EM2219291		307356		
Field ID			SW01	FD01		SW01	FS01		GW101	FD01		GW101	FS01		MW01	FD01	
Location Code			SW01			SW01	SW01		GW101			GW101	GW101		MW01		
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water		Water	Water	
Date			12/08/2022	12/08/2022		12/08/2022	12/08/2022		29/09/2022	29/09/2022		29/09/2022	29/09/2022		5/10/2022	5/10/2022	
Sample Type			Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD	Normal	Interlab_D	RPD	Normal	Field_D	RPD
	Unit	EQL															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	-	-	-	-	0.02	-	1.7	1.8	6	1.7	1.38	21	-	-	-
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	-	-	-	-	-	-	2.1	2.2	5	2.1	2.29	9	-	-	-
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.20	0.18	11	0.20	0.14	**35**	20	19	5	20	22.0	10	0.18	0.09	**67**
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	-	-	-	-	-	-	1.4	1.5	7	1.4	1.62	15	-	-	-
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	5.0	4.7	6	5.0	3.59	**33**	22	21	5	22	20.3	8	1.5	<0.01	**197**
Perfluorodecanesulfonic acid (PFDS)	µg/L	0.02	-	-	-	-	-	-	<0.02	<0.02	0	<0.02	<0.02	0	-	-	-
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	µg/L	0.02	-	-	-	-	<0.1	-	0.99	0.97	2	0.99	0.3	**107**	-	-	-
Perfluoropentanoic acid (PFPeA)	µg/L	0.02	-	-	-	-	<0.02	-	1.8	1.8	0	1.8	1.86	3	-	-	-
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	-	-	-	-	0.08	-	9.2	8.9	3	9.2	10.7	15	-	-	-
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	-	-	-	-	<0.02	-	0.79	0.80	1	0.79	0.71	11	-	-	-
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.04	0.04	0	0.04	0.03	29	1.5	1.5	0	1.5	1.08	**33**	0.03	<0.01	**100**
Perfluorononanoic acid (PFNA)	µg/L	0.01	-	-	-	-	-	-	0.19	0.19	0	0.19	0.18	5	-	-	-
Perfluorodecanoic acid (PFDA)	µg/L	0.02	-	-	-	-	-	-	<0.02	<0.02	0	<0.02	<0.02	0	-	-	-
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.02	-	-	-	-	-	-	<0.02	<0.02	0	<0.02	<0.02	0	-	-	-
Perfluorododecanoic acid (PFDoDA)	µg/L	0.02	-	-	-	-	-	-	<0.05	<0.05	0	<0.05	<0.02	0	-	-	-
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.02	-	-	-	-	-	-	<0.1	<0.1	0	<0.1	<0.02	0	-	-	-
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.05	-	-	-	-	-	-	<0.5	<0.5	0	<0.5	<0.05	0	-	-	-
PFAS - Perfluoroalkyl Sulfonamide																	
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	-	-	-	-	-	-	<0.1	<0.1	0	<0.1	<0.02	0	-	-	-
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	-	-	-	-	-	-	<0.05	<0.05	0	<0.05	<0.05	0	-	-	-
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	-	-	-	-	-	-	<0.1	<0.1	0	<0.1	<0.05	0	-	-	-
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	-	-	-	-	-	-	<0.02	<0.02	0	<0.02	<0.02	0	-	-	-
N-Methyl perfluorooctane sulfonamidoethanol (MEFOSE)	µg/L	0.05	-	-	-	-	-	-	<0.05	<0.05	0	<0.05	<0.05	0	-	-	-
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	-	-	-	-	-	-	<0.5	<0.5	0	<0.5	<0.05	0	-	-	-
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	-	-	-	-	-	-	<0.02	<0.02	0	<0.02	<0.02	0	-	-	-
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	-	-	-	-	<0.05	-	<0.01	<0.01	0	<0.01	<0.05	0	-	-	-
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.01	0.12	0.13	8	0.12	0.11	9	0.67	0.73	9	0.67	0.62	8	0.08	<0.01	**156**
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.02	0.1	0.08	22	0.1	0.07	**35**	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.02	-	-	-	-	<0.05	-	<0.02	<0.02	0	<0.02	<0.05	0	-	-	-
PFAS - Sums																	
Sum of PFHxS and PFOS	µg/L	0.01	5.2	4.9	6	5.2	3.73	**33**	41	40	2	41	42.3	3	1.6	0.09	**179**
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	5.0	4.7	6	5.0	-	-	23	23	0	23	-	-	1.5	<0.01	**197**
PFAS (Sum of Total)	µg/L	0.01	5.4	5.1	6	5.4	-	-	62	60	3	62	63.0	2	1.8	0.09	**181**
PFAS (Sum of Total)(WA DER List)	µg/L	0.01	-	-	-	-	4.04	-	-	-	-	-	59.0	-	-	-	-

***RPDs have only been considered where a concentration is greater than 1 times the EQL.**
****Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: 30 (1 - 10 x EQL); 30 (10 - 30 x EQL); 30 (> 30 x EQL))**
*****Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory**

Field Blanks

		Lab Report Number	33011		33104	33105	33107	33831	307356
		Matrix Type	Water		Water	Water	Water	Water	Water
		Field ID	RB01	RB02	RB03	RB05	RB04	RB01	RB01
		Date	4/08/2022	5/08/2022	11/08/2022	12/08/2022	12/08/2022	29/09/2022	5/10/2022
	Unit	EQL							
PFAS - Perfluoroalkyl Sulfonic Acids									
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFAS - Perfluoroalkyl Carboxylic Acids									
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFAS - Fluorotelomer Sulfonic Acids									
6:2 Fluorotelomer Sulfonate (6:2 FTS)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PFAS - Sums									
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of US EPA PFAS (PFOS + PFOA)*	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
PFAS (Sum of Total)	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Appendix J

Calibration Certificates

PID Calibration Certificate

Instrument **PhoCheck Tiger**
Serial No. **T-105431**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6 ev			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm	N/A	N/A
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		100ppm Isobutylene	NIST	259379		99.3ppm

Calibrated by: **Indiana Veenstra**

Calibration date: **25/07/2022**

Oil / Water Interface Meter

Instrument Interface Meter (30M)
Serial No. 288154

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
	above 7.9V		
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Tested by: Indiana Veenstra

Test date: 1/08/2022

Next Test due: 28/01/2023

PID Calibration Certificate

Instrument PhoCheck Tiger
Serial No. T-118544

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments			
Battery	Charge Condition	✓				
	Fuses	✓				
	Capacity	✓				
	Recharge OK?	✓				
Switch/keypad	Operation	✓				
Display	Intensity	✓				
	Operation (segments)	✓				
Grill Filter	Condition	✓				
	Seal	✓				
Pump	Operation	✓				
	Filter	✓				
	Flow	✓				
	Valves, Diaphragm	✓				
PCB	Condition	✓				
Connectors	Condition	✓				
Sensor	PID	✓	10.6eV			
Alarms	Beeper	✓	Low	High	TWA	STEL
	Settings	✓	50ppm	100ppm		
Software	Version	✓				
Data logger	Operation	✓				
Download	Operation	✓				
Other tests:						

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Calibration gas and concentration	Certified	Gas bottle No		Instrument Reading
PID Lamp		100ppm Isobutylene		259379		102.3ppm

Calibrated by: Indiana Veenstra

Calibration date: 8/08/2022

Next calibration due: 7/11/2022

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **10E101054**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Diffusion mode Aspirated mode

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. pH 7.00		pH 7.00		372012	pH 7.07
2. pH 4.00		pH 4.00		372374	pH 4.01
3. mV		231 mV		355024/355023	241.3 mV
4. EC		2.76ms		377099	2.76mS
6. D.O		0 ppm		329994	0 ppm
7. Temp		15.2		MultiThem	15.2

Calibrated by: **Indiana Veenstra**

Calibration date: **9-Aug-22**

Calibration Due: **9-Sep-22**

KENNARDS HIRE

EQUIPMENT CERTIFICATION REPORT

PGN9[illegible] TER QUALITY METER – MULTIFUNCTION (YSI PRO PLUS)

Plant Nu[illegible] 088645 Serial Number: 21H1042243

SENSOR	CONCENTRATION	SPAN 1	SPAN 2	TRACEABILITY	PASS
pH	pH 7.00 / pH 4.00	7.00 pH	4.00 pH	330734 380327	☑
Conductivity	12.88 mS/cm	12.88 mS/cm	—	343265	☑
Dissolved Oxygen	Sodium Sulphite / Air	0.0% in Sodium Sulphite	% Saturation in Air	10465	☑
ORP	240mV @ 20°C	240mV	—	337308 338782	☑

Battery Status 80 %	Temperature 19,0 °C
Electrodes Cleaned and Checked	

Note: Calibration solution traceability information is available upon request.

Checked By: Wilma Fouché Date: 20/9/22 Signed: [signature]

Accessories List:

User's Manual	pH Sensor	Conductivity/ Temp Sensor
Dissolved Oxygen Sensor	Redox (ORP) Sensor	Flow Cell
User Guide	Stainless Steel Restrictor	Spare Batteries
Calibration Cup		

Oil / Water Interface Meter

Instrument **Interface Meter (30M)**
Serial No. **288051**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	
	above 7.9V	✓	
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Tested by: **Anoop Kumar**

Test date: **1/09/2022**

Next Test due: **28/02/2023**

Multi Parameter Water Meter

Instrument **YSI Quatro Pro Plus**
Serial No. **18G103308**

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Charge Condition	✓	
	Fuses	✓	
	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
Grill Filter	Condition	✓	
	Seal	✓	
PCB	Condition	✓	
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. mV	✓	
	3. EC	✓	
	4. D.O	✓	
	5. Temp	✓	
Alarms	Beeper		
	Settings		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Serial no	Standard Solutions	Certified	Solution Bottle Number	Instrument Reading
1. D.O		0 ppm		10640	0 ppm
2. Conductivity		2760uS		3845407	2773uS
3. pH7		pH 7.00		386467	pH 6.95
4. pH4		pH 4.00		389384	pH 4.05
5. ORP mV		239 mV		333082/329762	231.4 mV
7. Temp °C		17.7		Multimeter	17.8

Calibrated by: **Anthony Marafioti**

Calibration date: **29-Sep-22**

Next calibration due: **28-Mar-23**

Solinst Model 122 Interface Meter

Instrument Interface Meter (30M)
Serial No. 312011

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Compartment	✓	
	Capacity	✓	9.0V
Probe	Cleaned/Decon.	✓	
	Operation	✓	
Connectors	Condition	✓	
		✓	
Tape Check	Cleaned	✓	
Connectors	Checked for cuts	✓	
Instrument Test	At surface level	✓	

Certificate of Calibration

This is to certify that the above instrument has been cleaned and tested.

Calibrated by: Anthony Marafioti

Calibration date: 27/09/2022

Next calibration due: 26/11/2022

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